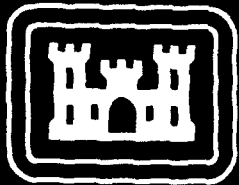


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**US Army Corps  
of Engineers**



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TECHNICAL REPORT GL-92-1

LOGIC RECONNAISSANCE  
OF  
HREVEPORT, LOUISIANA TO  
GERFIELD, TEXAS REACH  
REDRIVER WATERWAY

by

PAUL ALBERTSON

Geotechnical Laboratory

DEPARTMENT OF THE ARMY

ways Experiment Station, Corps of Engineers

3909 Halls Ferry Road



**DTIC**  
**ELECTE**  
**NOV 04 1993**  
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 Waterway

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 white"

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# RED RIVER WATERWAY

by

PAUL ALBERTSON

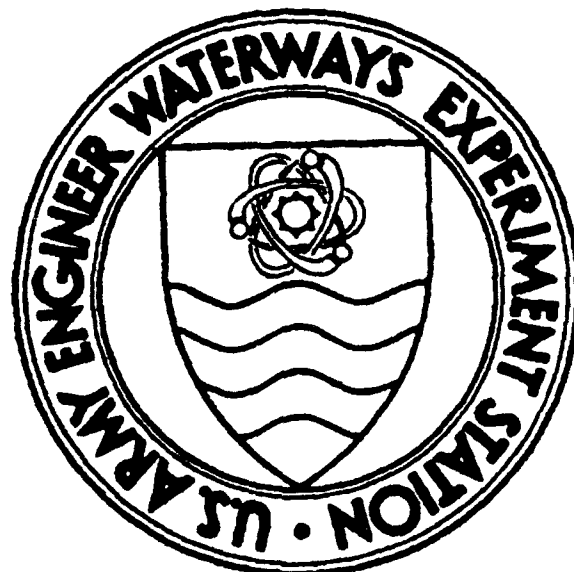
Geotechnical Laboratory

DEPARTMENT OF THE ARMY

Waterways Experiment Station, Corps of Engineers

3909 Halls Ferry Road

Vicksburg, Mississippi 39180-6199

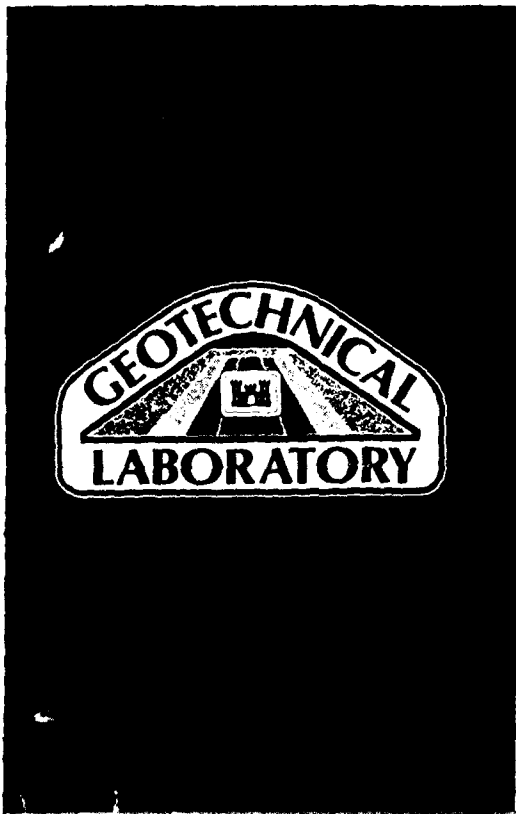


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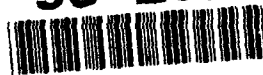
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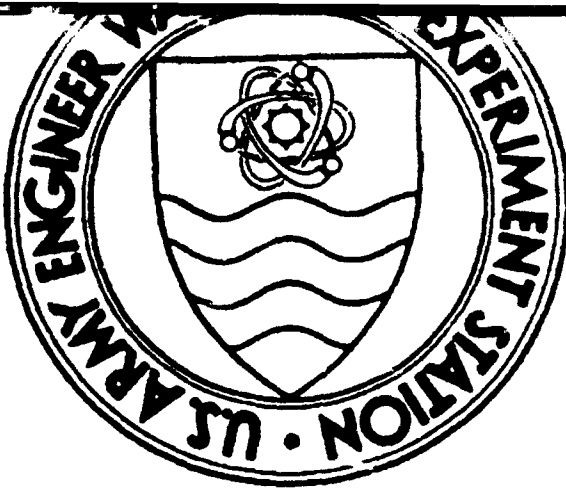
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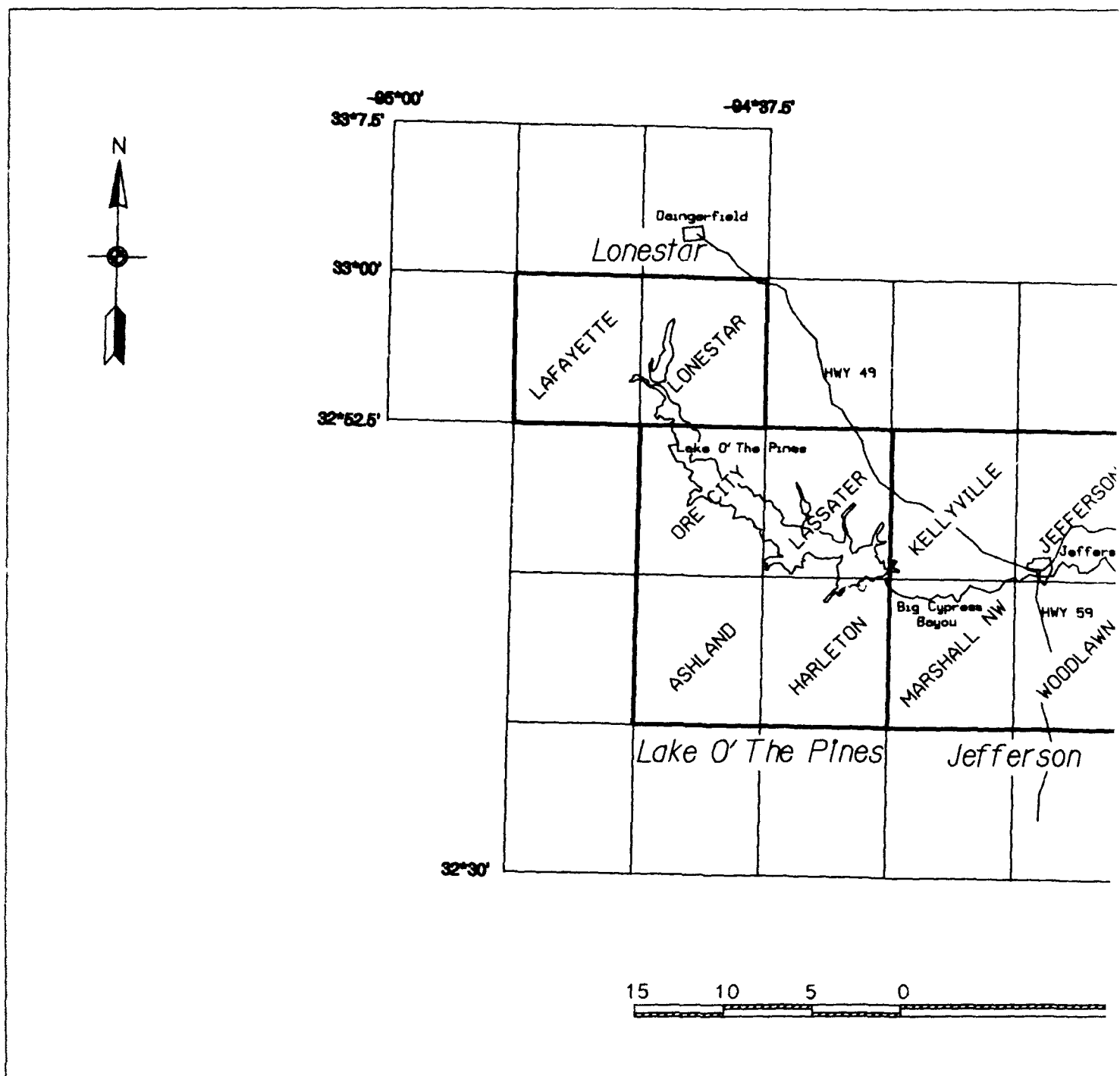
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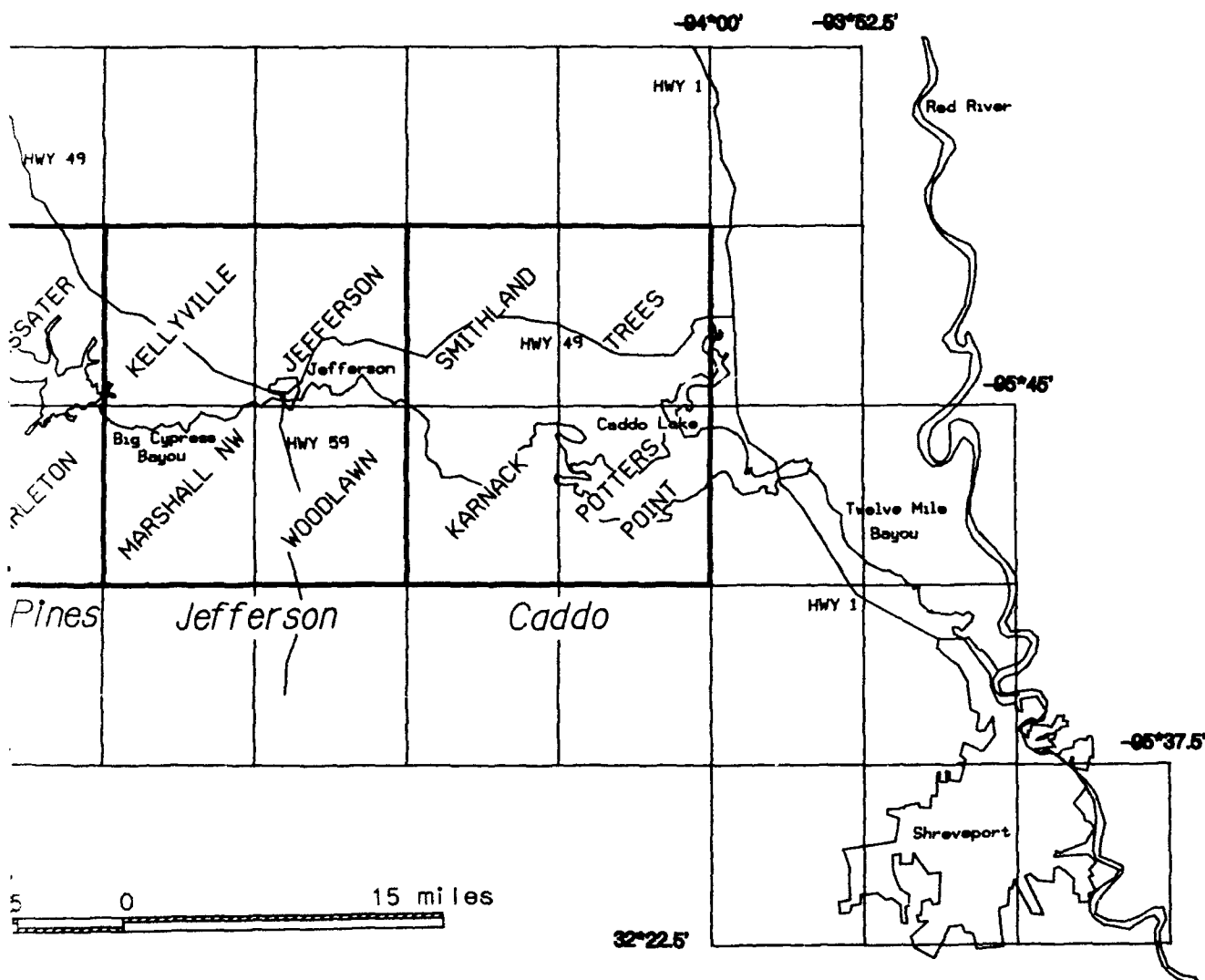
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Vicksburg, Mississippi 39180-0060

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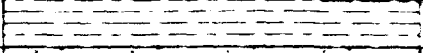

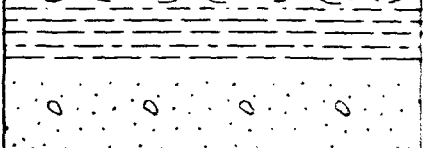
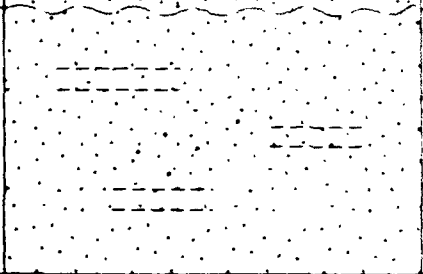
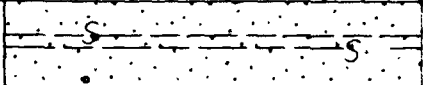
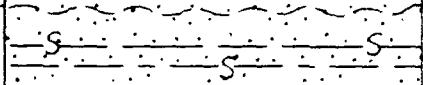
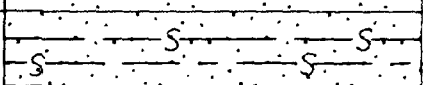
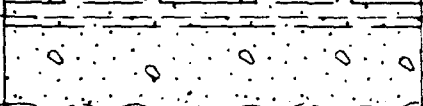
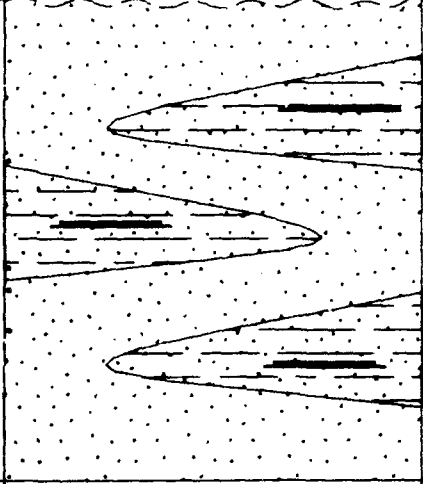
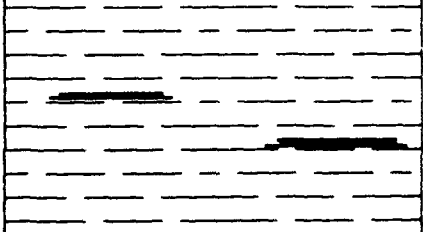
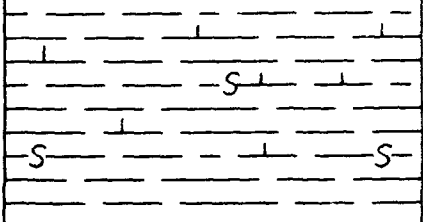
Index Of Geologic

ERA	SYSTEM	SERIES	GROUP	FORMATION OR UNIT	GENERALIZED SECTION	
	QUATERNARY	RECENT	ALLUVIUM	TOPSTRATUM		Differentiated laid down by r and brown cle
				SUBSTRATUM		Massive sands coarse grains the middle of
	EISTO-CENE		TERRACE DEPOSITS	UNDIFFERENTIATED		Clays and s1

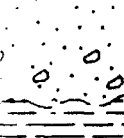
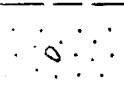
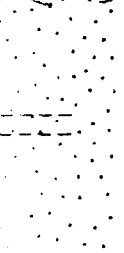
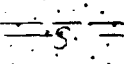
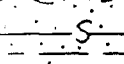
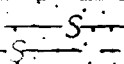
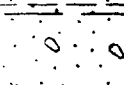
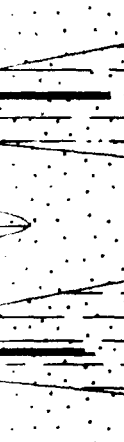
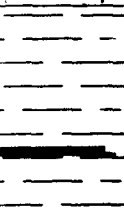
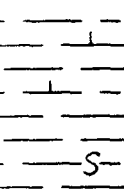


Index Of Geologic Maps

GENERALIZED SECTION	LITHOLOGY	HYDROGEOLOGY
	Differentiated into six distinct environments of deposition laid down by meandering streams. Deposits composed of gray and brown clays and silts.	Yields little water, not generally an aquifer.
	Massive sands and gravels. Fine to medium sands becoming coarse-grained with depth. First gravels generally appear near the middle of the deposit.	Yields small quantities of fresh water to a few wells.
	Clays and silts grading downward into sands and gravels.	Yields small quantities of fresh water to a few wells.

CENOZOIC	QUATERNARY	RECENT	ALLUVIUM	TOPSTRATUM		Thin sandstone laid down by meandering channels and brown clays.
				SUBSTRATUM		Massive sands or coarse-grained in the middle of the
		PLEISTOCENE	TERRACE DEPOSITS	UNDIFFERENTIATED		Clays and silts
	TERTIARY	EOCENE	CLAIBORNE	SPARTA		Nonmarine, massive shale. In subsurface common.
				WECHES		Green to red, green ironstone concretions
				QUEEN CITY		Interbedded, light sands and clays
				REKLAW		Soft to hard, light fossiliferous, light crystals.
				CARRIZO (NOT PRESENT IN STUDY AREA)		Fine to very fine bedded sands with locally ironstone of formation.
			WILCOX	UNDIFFERENTIATED		Interbedded, green medium-grained
		PALEOCENE				
			MIDWAY			Massive, dark green with calcareous
						Light to dark with occasional...

Generalized Stratigraph

	Differentiated into six distinct environments of deposition laid down by meandering streams. Deposits composed of gray and brown clays and silts.		Yields little water, not generally an aquifer.
	Massive sands and gravels. Fine to medium sands becoming coarse-grained with depth. First gravels generally appear near the middle of the deposit.		Yields small quantities of fresh water to a few wells.
	Clays and silts grading downward into sands and gravels.		Yields small quantities of fresh water to a few wells.
	Nonmarine, massive sands with minor amounts of sandy clay or shale. In subsurface, lignite and other organic materials are common.		Yields small quantities of fresh water to shallow wells locally.
	Green to red, glauconitic, fossiliferous, sands and clays with ironstone concretions.		Yields small quantities of fresh water to wells locally.
	Interbedded, light gray, glauconitic, lignitic, fossiliferous, sands and clays.	CYPRESS AQUIFER	Yields small to moderate quantities of fresh water to wells.
	Soft to hard, light gray green to red, glauconitic, fossiliferous, lignitic micaceous sands and clays with gypsum crystals.		Yields small quantities of fresh water to wells.
	Fine- to very fine-grained, feldspathic, glauconitic, cross-bedded sands with some siltclips and rounded inclusions. Locally iron-cemented sandstone boulders are found at top of formation.		Yields small to moderate quantities of fresh water to wells.
	Interbedded, gray to chocolate brown, calcareous, fine- to medium-grained sands, lignitic silts, clays, and lignite.		Yields moderate to possibly large quantities of fresh water to wells.
	Massive, dark gray to black, lignitic, micaceous, calcareous clay with calcareous concretions.		
	Light to dark gray, fossiliferous, glauconitic, silts and clays with occasional chalk lenses and calcareous concretions.		Yields no water.

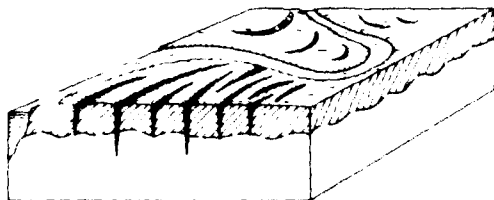
Generalized Stratigraphic Column

TOPS/RATUM  
DEPOSITIONAL  
ENVIRONMENT

DIAGRAMMATIC ILLUSTRATION

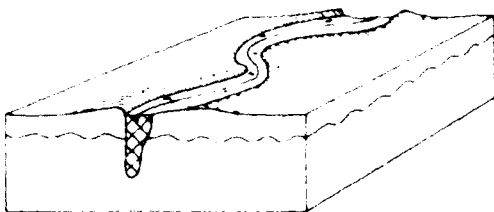
TYPICAL APPEARENCE  
ON AERIAL PHOTOGRAPHS

POINT BAR



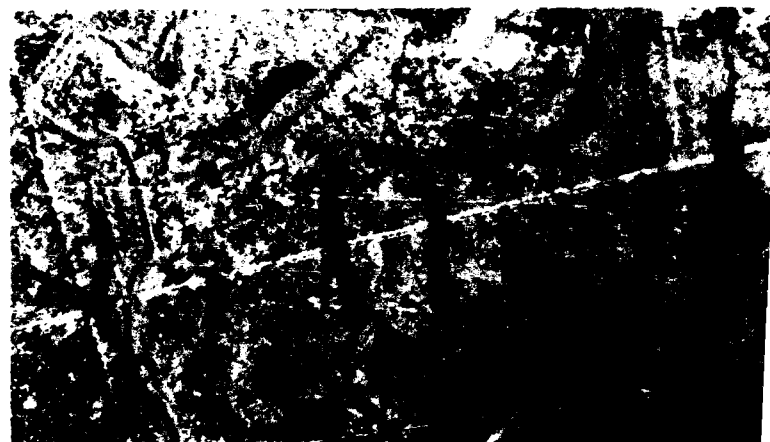
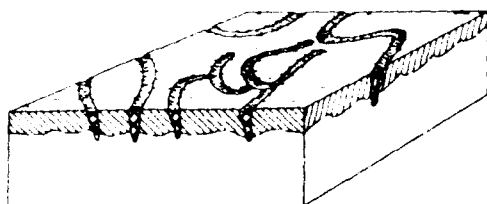
2000 1000 0 2000 Ft.  
Scale

ABANDONED  
COURSE



2000 1000 0 2000 Ft.  
Scale

ABANDONED  
CHANNEL



2000 1000 0 2000 Ft.  
Scale

# ENCE GRAPHS

## METHOD OF DEPOSITION

## OCCURRENCE AND CHARACTERISTICS



2000 Ft.

Point bar deposits consist of deposits laid down at the insides of river bends as a result of meandering of the stream. Although the deposits extend to a depth equal to the deepest portion or thalweg of the parent stream, only the uppermost fine-grained portion is included as part of the top stratum. Within the point bar top stratum, there are two types of deposits: soft and sandy elongate bar deposits or ridges that are laid down during high stages on the stream and left in place during low stages; and depressions or "swales" that are laid down during falling river stages. Characteristic of the ridges and swales form an alternating series called "rib and slot" type configuration conformable to the curvature of meandering channels and indicates the direction and extent of meandering.

Point bar deposits are deposited in the upper part of the channel, and are typically composed of fine-grained material. They are deposited in the upper part of the channel, and are typically composed of fine-grained material. They are deposited in the upper part of the channel, and are typically composed of fine-grained material.



2000 Ft.

Abandoned channels are straight segments of a river abandoned when the stream forms a new course across the floodplain. The abandoned course by definition is a segment that is no longer a loop. The older course gradually fills with fine-grained sediment except for a wedge of relatively coarse-grained sediment where the new course diverges from the old. In many cases, a small, white, stream meanders within the confines of the larger meander belt and destroys segments of the abandoned course. In other cases, the smaller stream abandons the extent of the abandoned course when there are no other indications of its presence.

Abandoned channels are straight segments of a river abandoned when the stream forms a new course across the floodplain. The abandoned course by definition is a segment that is no longer a loop. The older course gradually fills with fine-grained sediment except for a wedge of relatively coarse-grained sediment where the new course diverges from the old. In many cases, a small, white, stream meanders within the confines of the larger meander belt and destroys segments of the abandoned course. In other cases, the smaller stream abandons the extent of the abandoned course when there are no other indications of its presence.

Data defining the characteristics of abandoned channels is limited in quantity. It appears that segments of abandoned channels may be as long as 10 miles from the point of abandonment. The fine-grained sediment is typically composed of soft to medium brown to gray clay with silt interbeds. The lower portion of the channel is typically composed of fine-grained sediment.



2000 Ft.

Abandoned channels are partially or wholly filled segments of meandering streams formed when the stream shortens its course. Soon after formation, they are usually characterized by open water, called "oxbow lakes." Subsequently, they may become filled and occasionally completely obscured by various meander belt deposits. The abandoned segment may represent an entire meander loop formed by the stream cutting directly across a narrow neck of two converging arms of a loop and is termed a neck cutoff. A chute cutoff represents a portion of a loop formed when a stream occupied a large point bar swale during flood stage and abandoned the outer portion of the loop.

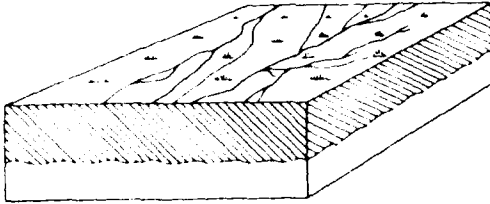
Abandoned channels are 0.25 to 0.5 miles long following the loop. These channels are 15 to 30 feet deep and are filled with soft to medium brown to gray clay with silt interbeds.

The larger abandoned channels are believed to be formed in the early Holocene during wetter climatic conditions.



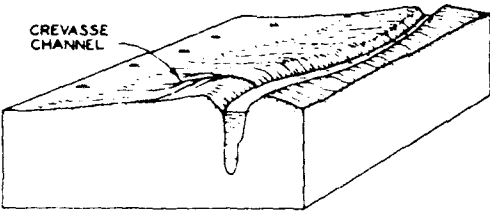
2000 1000 0 2000 Ft.  
Scale

BACKSWAMP



2000 1000 0 2000 Ft.  
Scale

NATURAL  
LEVEE



2000 1000 0 2000 Ft.  
Scale

Description of Deposits

DTIC QUALITY INSPECTED

a stream occupied a large point bar below the flood stage and abandoned its course to the bay.

2000 Ft.



Backswamp deposits consist of fine grained sediments laid down in broad, shallow basins within the floodplain during major periods of stream flooding. The sediment carrying floodwater may be ponded between the natural levee ridges and the uplands. Backswamp areas typically have very low relief and a distinctive, and complicated drainage pattern. The channels alternately serve as tributaries and distributaries at different times of the annual flood cycle.

Backswamp deposits are scarce in the project area. The backswamps occur between valley walls and meander belts. Based on limited data the thickness of these deposits are 20 to 30 feet in the Big Cypress Bayou Valley.

Typical backswamp deposits are brown to gray clays with scattered lenses of silt organic matter and wood fragments.

2000 Ft.



Natural levees are broad, low ridges which flank both sides of streams that periodically overflow their banks. The coarsest and greatest quantities of sediment are deposited closest to the streams channels. The natural levees are highest and thickest in these areas and gradually thin away from the channels. In general, the greater the distance from the stream, the greater the percentage of the finer grained sediments. Small drainage channels trending at right angles to the parent stream down the backslope of the levees are common. Major crevasses are indicated when these channels are large and pronounced. Abandoned crevasse channels are often filled with sediments that are distinctly coarser than the remainder of the natural levee.

Natural levees occur along abandoned courses and channels and adjacent to the active Cypress bayou channels. The higher and better drained levee deposits bordering older courses are visible by noting a vegetation change from cypress (*Taxodium*) to oaks and pine (*Quercus* and *Pinus*). Other levee deposits are obscured by recent postsettlement basin infilling or simply erased by reworking by younger courses. Natural levees paralleling courses vary in height from 2 to 5 feet and in width from 100 to 1500 feet.

Natural levee deposits typically consist of brown silty sands, silt, and silty clays which exhibit moderate amounts of oxidation. Since natural levees are well drained, the water content of these soils is low and organic matter is seldom present except for roots.

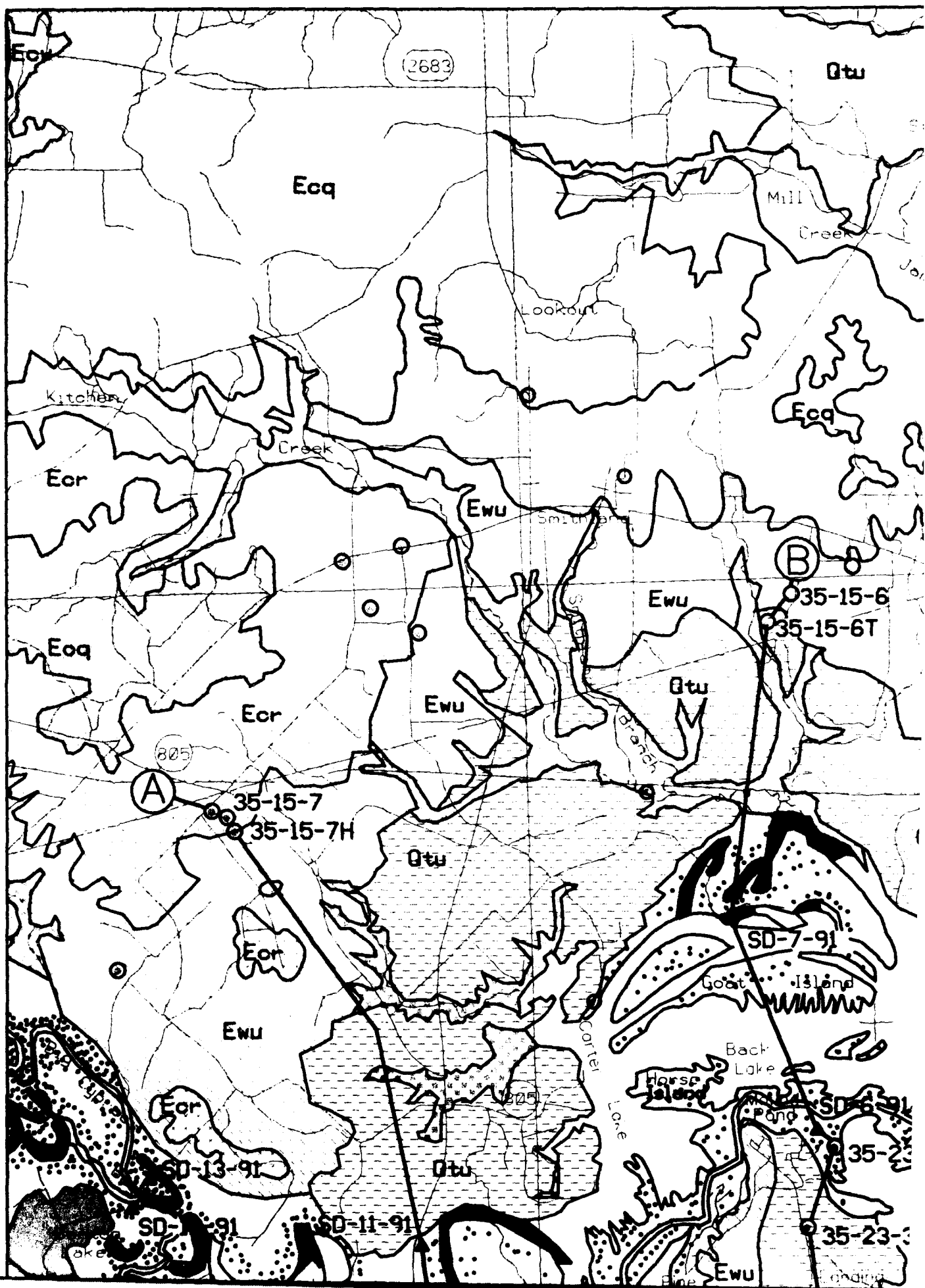
2000 Ft.

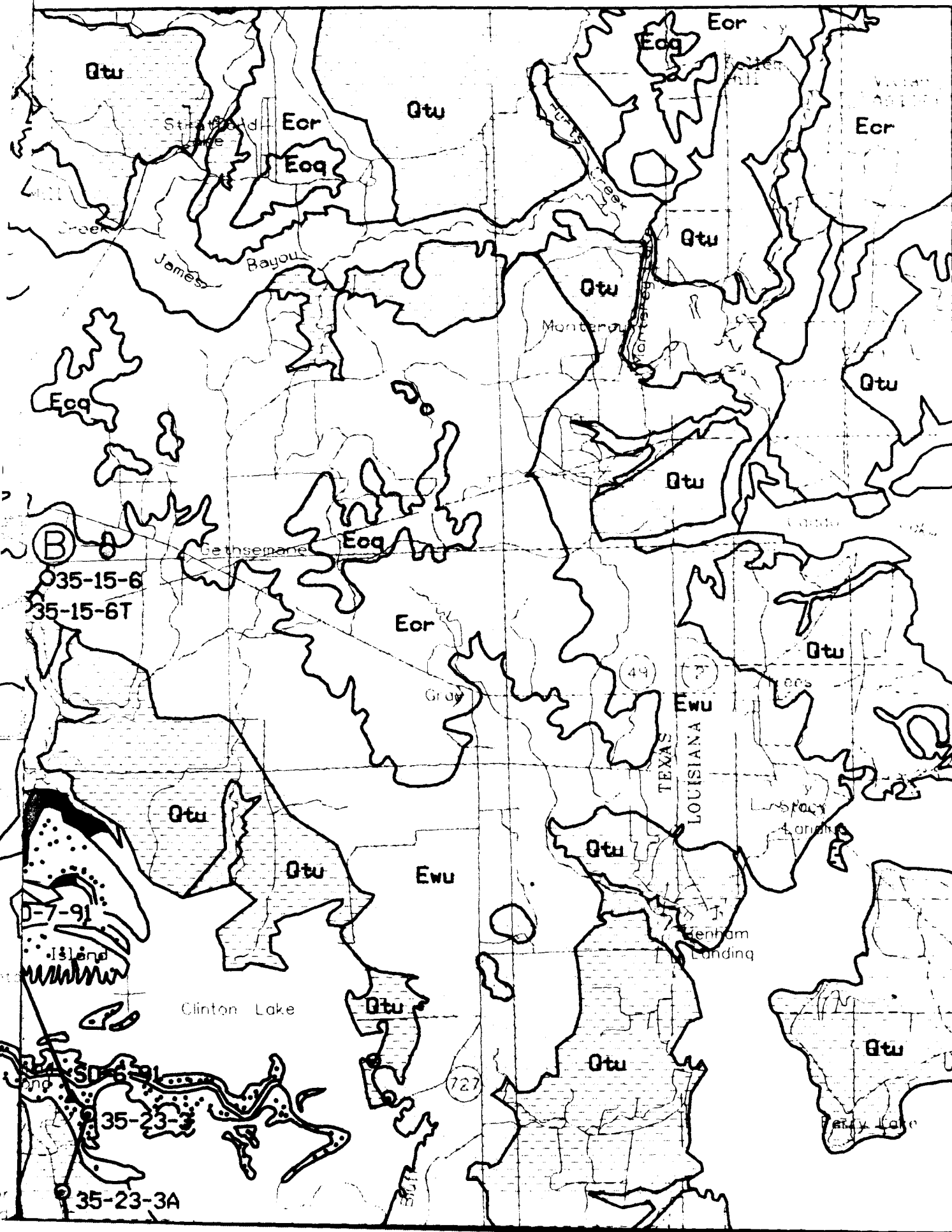
## of Depositional Environments

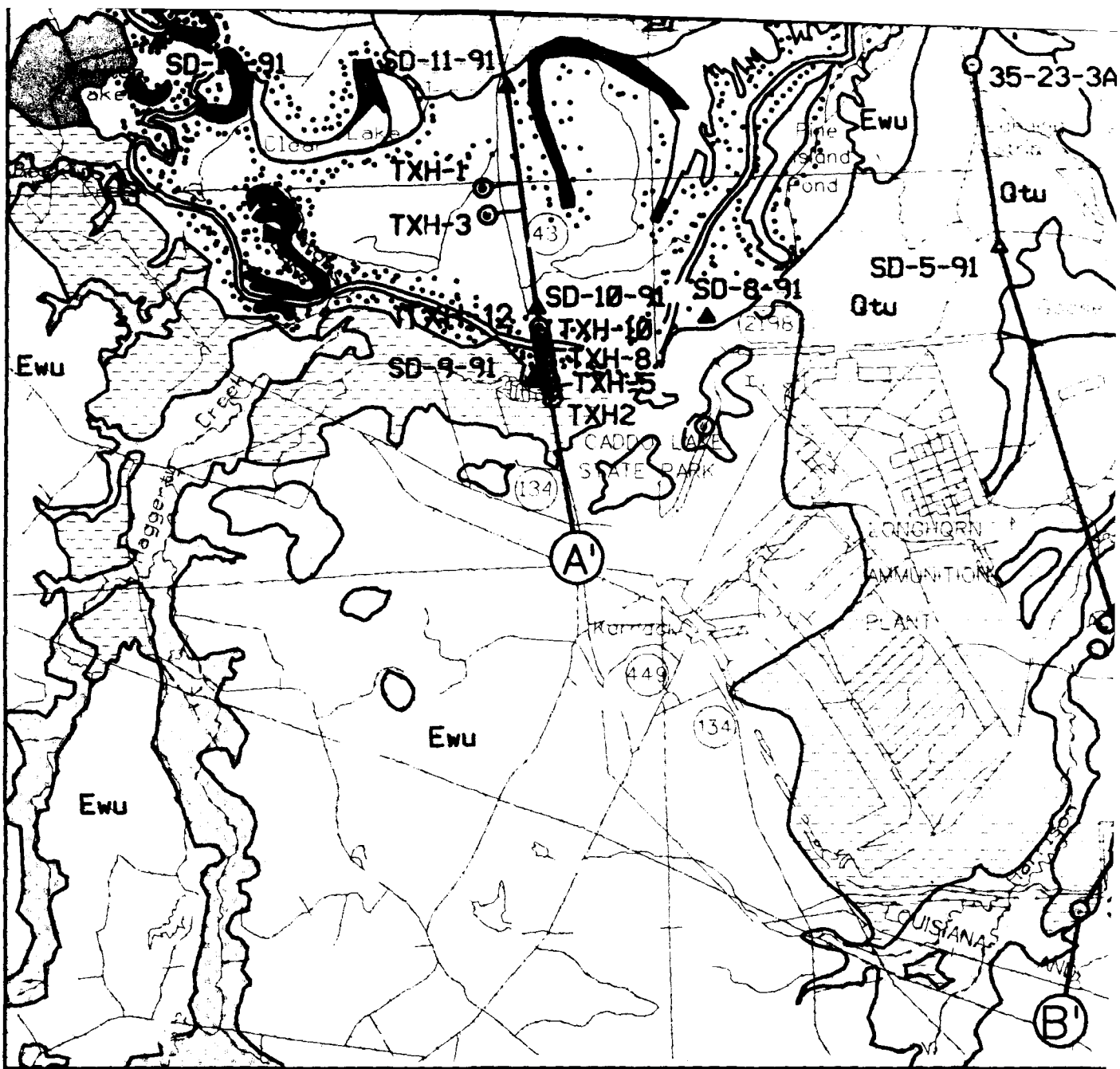
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Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution	
Availability Codes	
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32° 52' 30"



$32^{\circ}52'30''$ 



32° 37' 30"

94° 15'

## LEGEND

### QUATERNARY

#### RECENT

-  NATURAL LEVEE
-  POINT BAR
-  BACKSWAMP
-  ABANDONED CHANNEL
-  ABANDONED COURSE
-  UNDIFFERENTIATED ALLUVIUM






#### PLEISTOCENE





-  UNDIFFERENTIATED TERRACE DEPOSITS

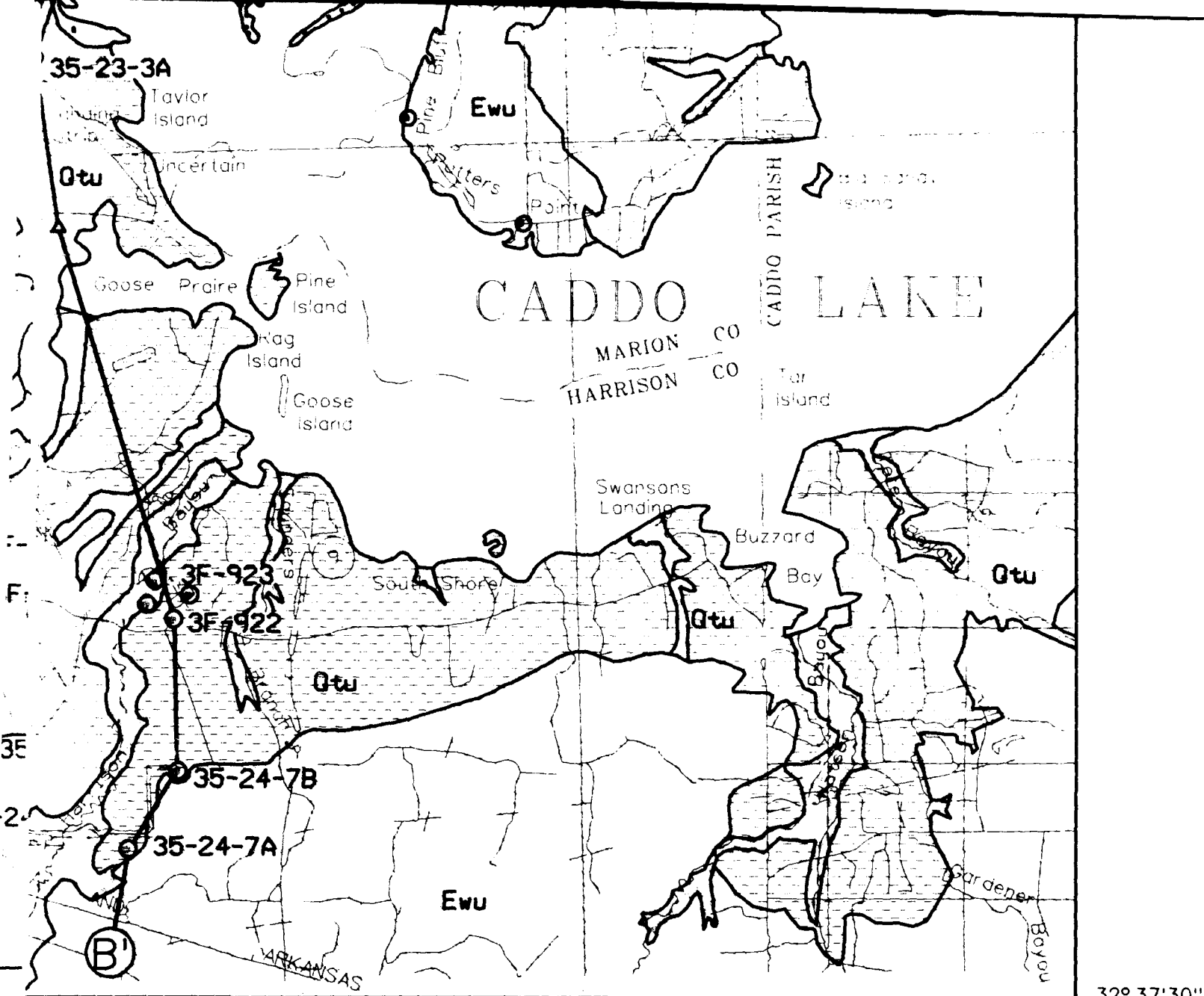
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#### EOCENE

#### CLAIBORNE GROUP

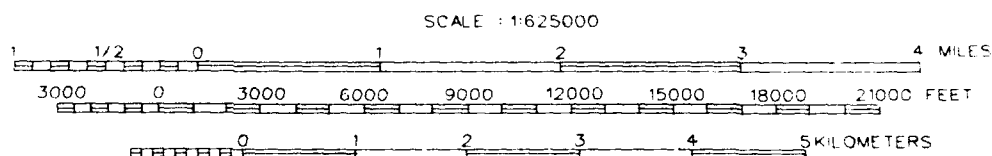
-  SPARTA FORMATION
-  WECHES FORMATION
-  QUEEN CITY FORMATION
-  REKLAW FORMATION
-  WILCOX GROUP UNDIFFERENTIATED

-  CONTACT
-  FAULT
-  BORING
-  PIEZOMETER



32° 37' 30"

94° 00

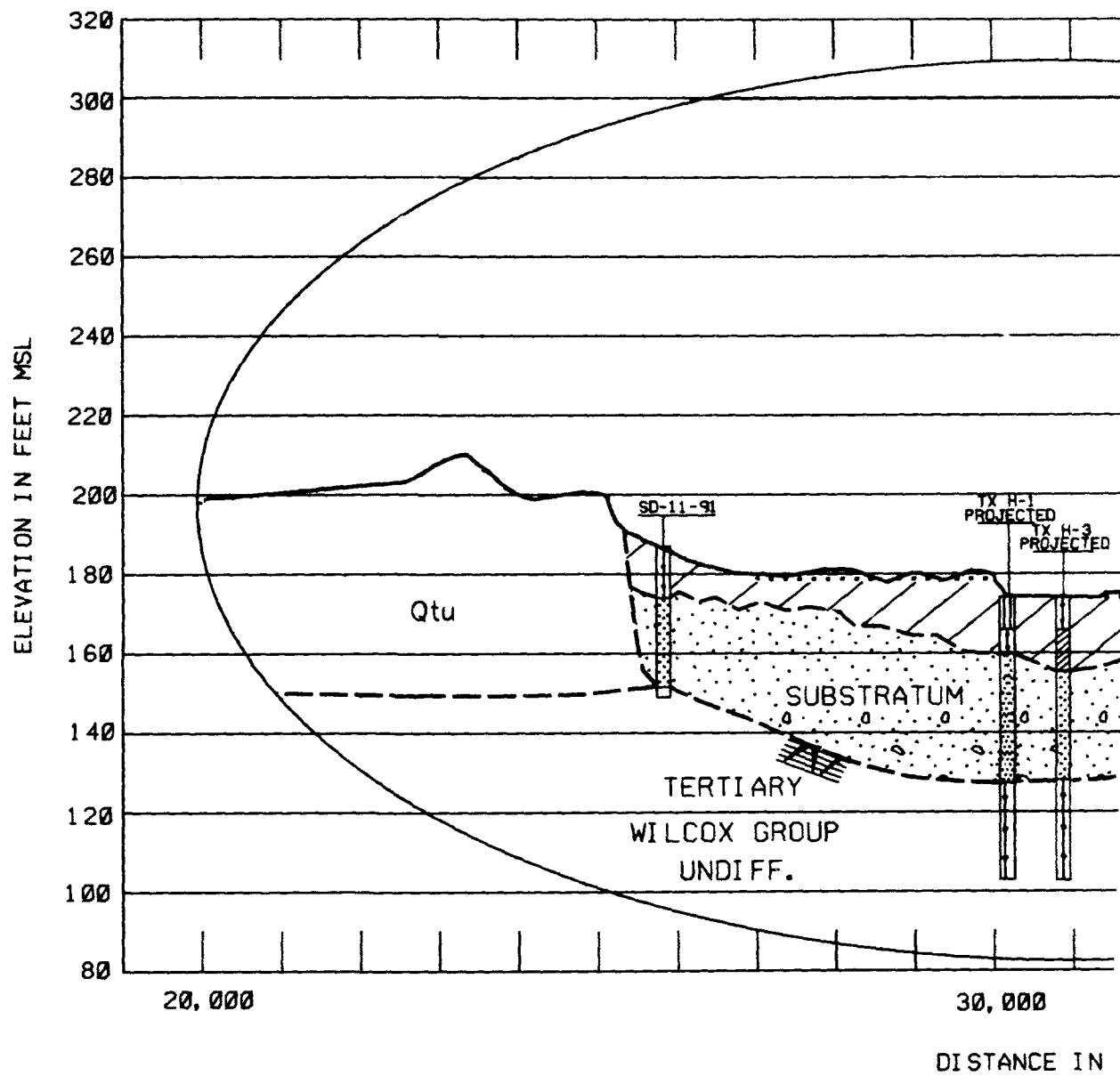


SHREVEPORT, LA - DANGERFIELD, TX

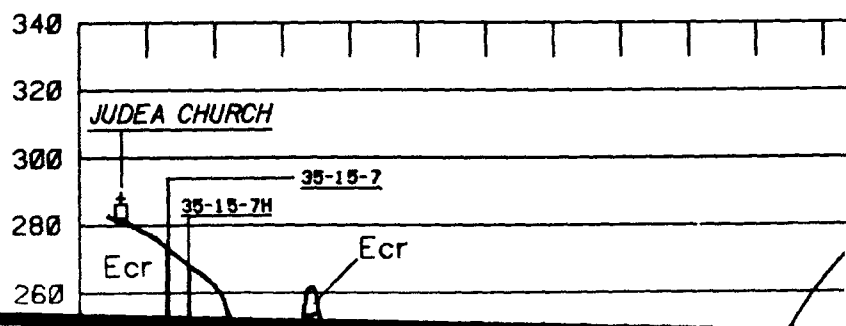
SURFACE GEOLOGY

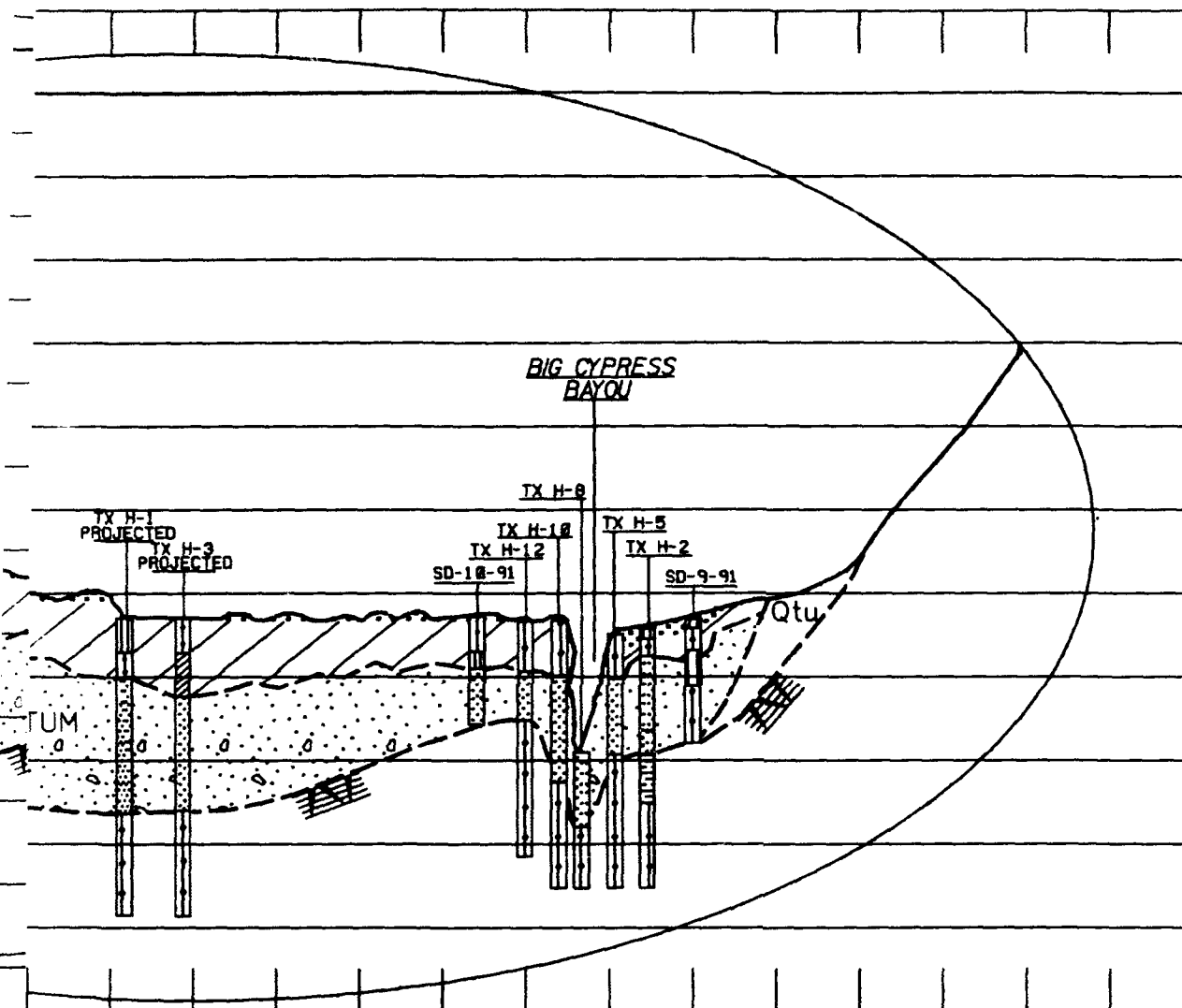
CADDO, TX

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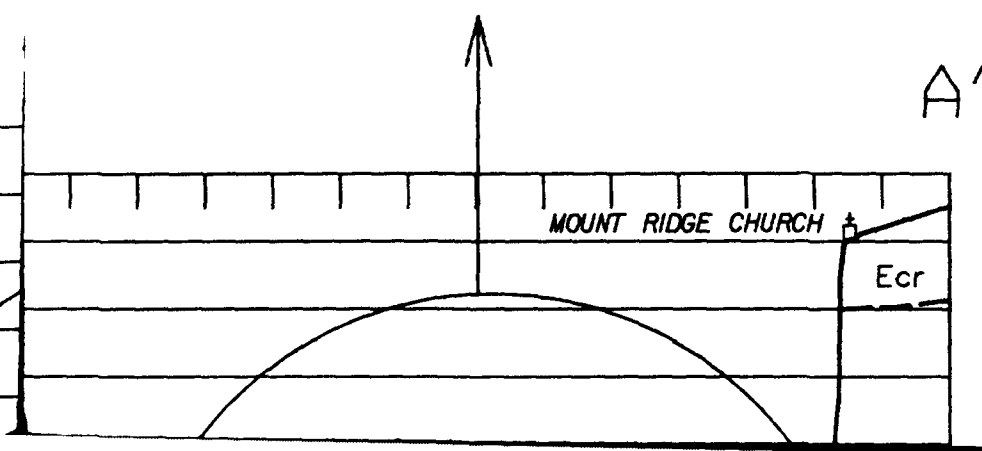


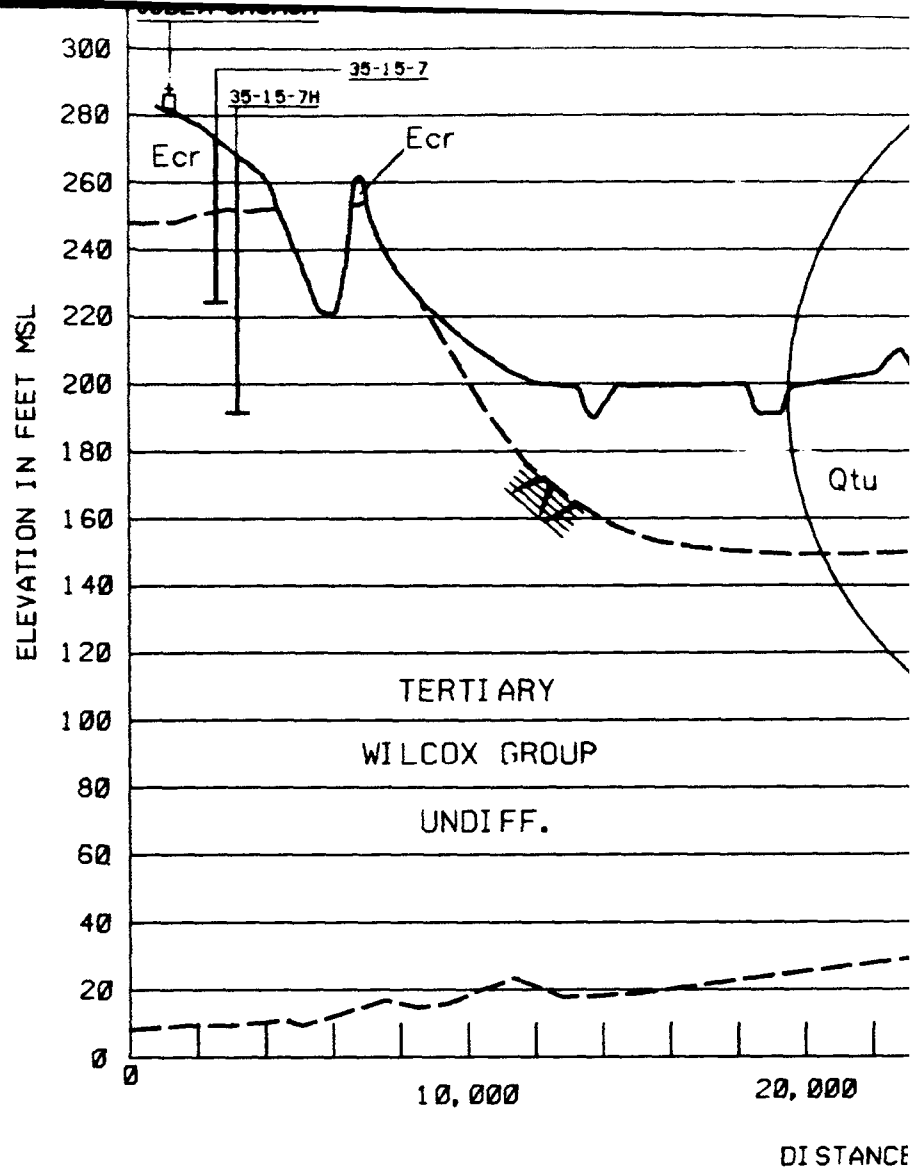


30,000

40,000

DISTANCE IN FEET





### LEGEND

#### ENVIRONMENTS OF DEPOSITION

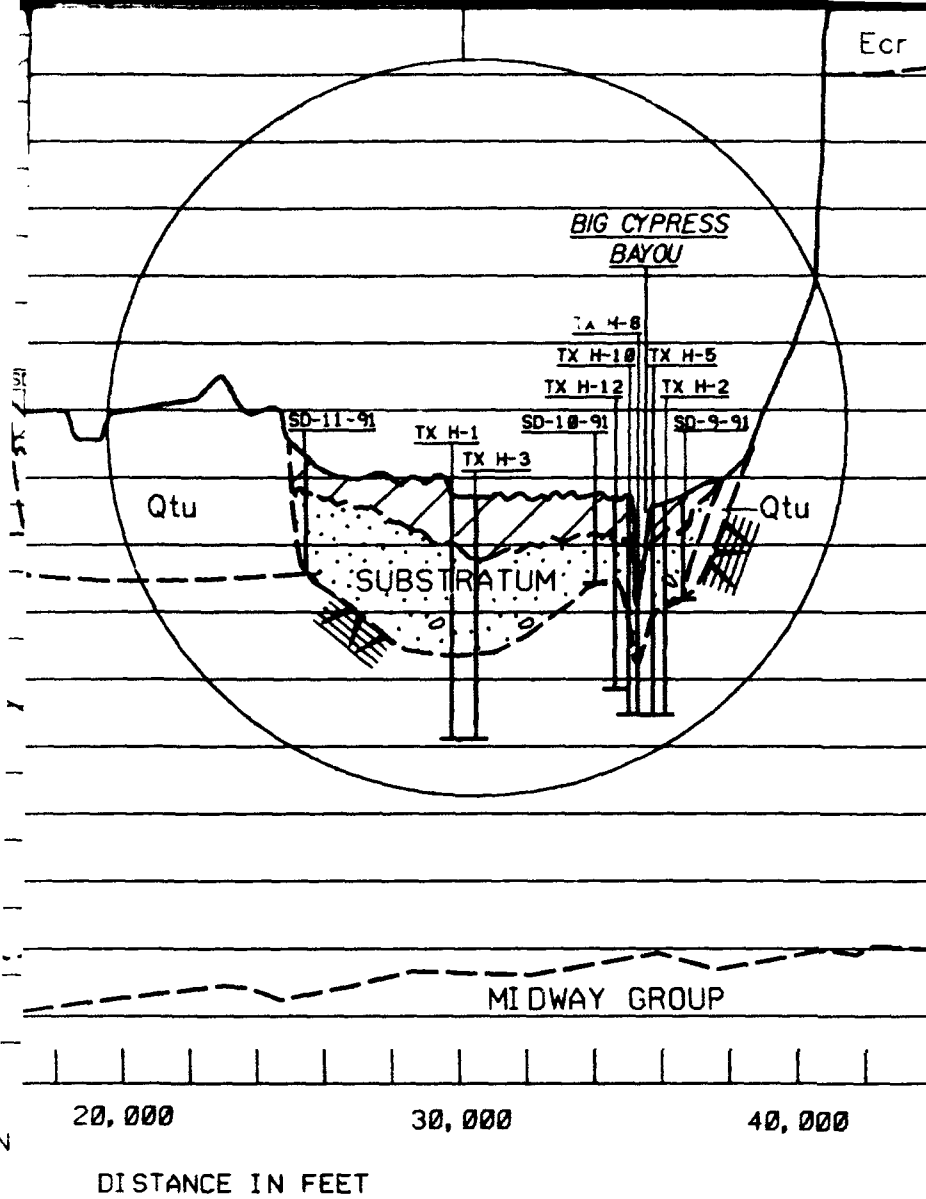
	NATURAL LEVEE
	POINT BAR
	BACKSWAMP
	ABANDONED CHANNEL
	ABANDONED COURSE

#### LITHOLOGY

	UNDIFFERENTIATED SAND AND GRAVEL
	SAND
	SILTY SAND
	SILT
	SANDY CLAY
	CLAY
	SHALE
	FILL

#### MAPPING SYMBOLS

	ALLUVIUM UNDIFF.
	TERRACE DEPOSITS UNDIFF.
	TERTIARY SURFACE
	SPARTA
	WECHES
	QUEEN CITY
	REKLAW
	WILCOX UNDIFF.

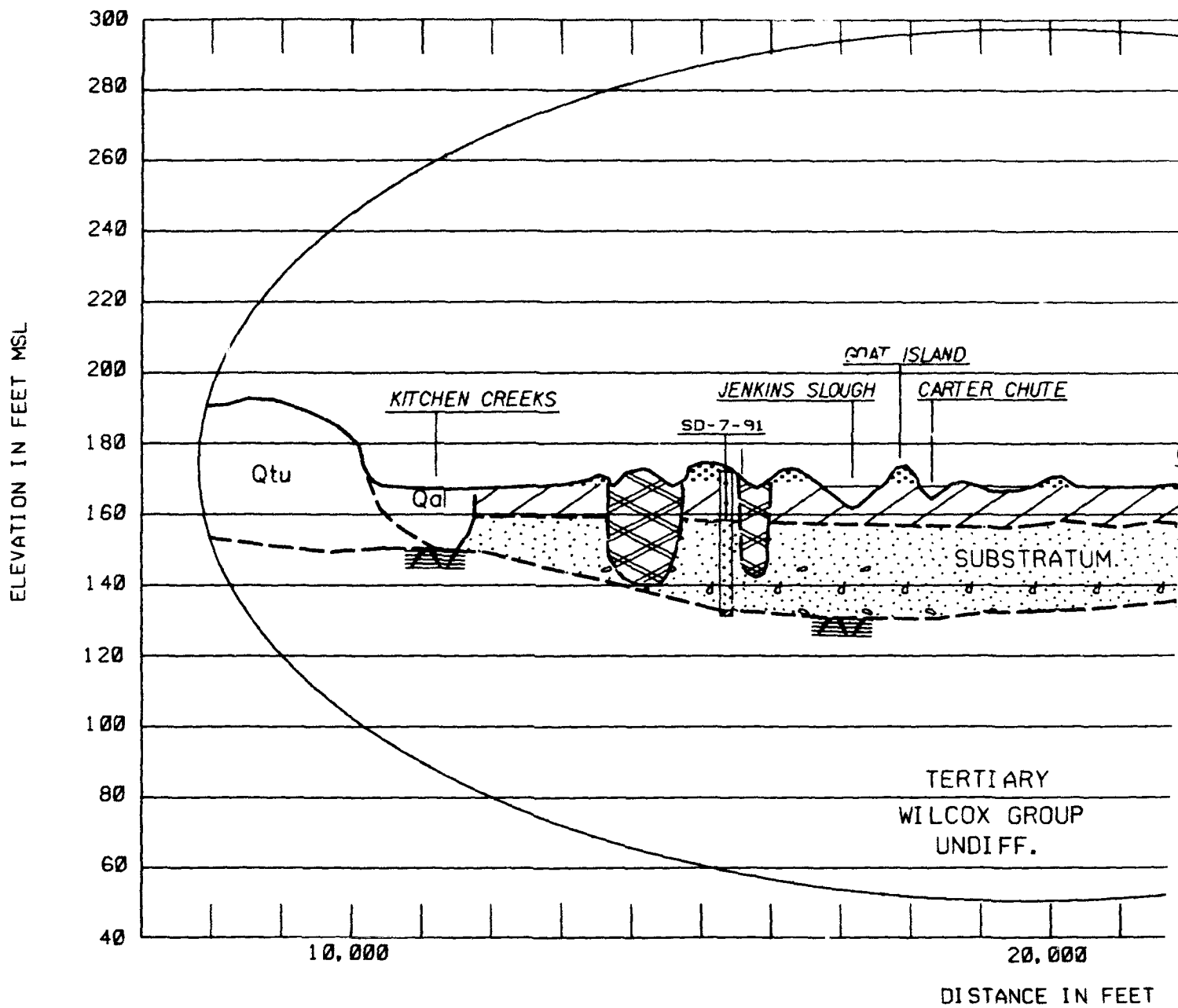


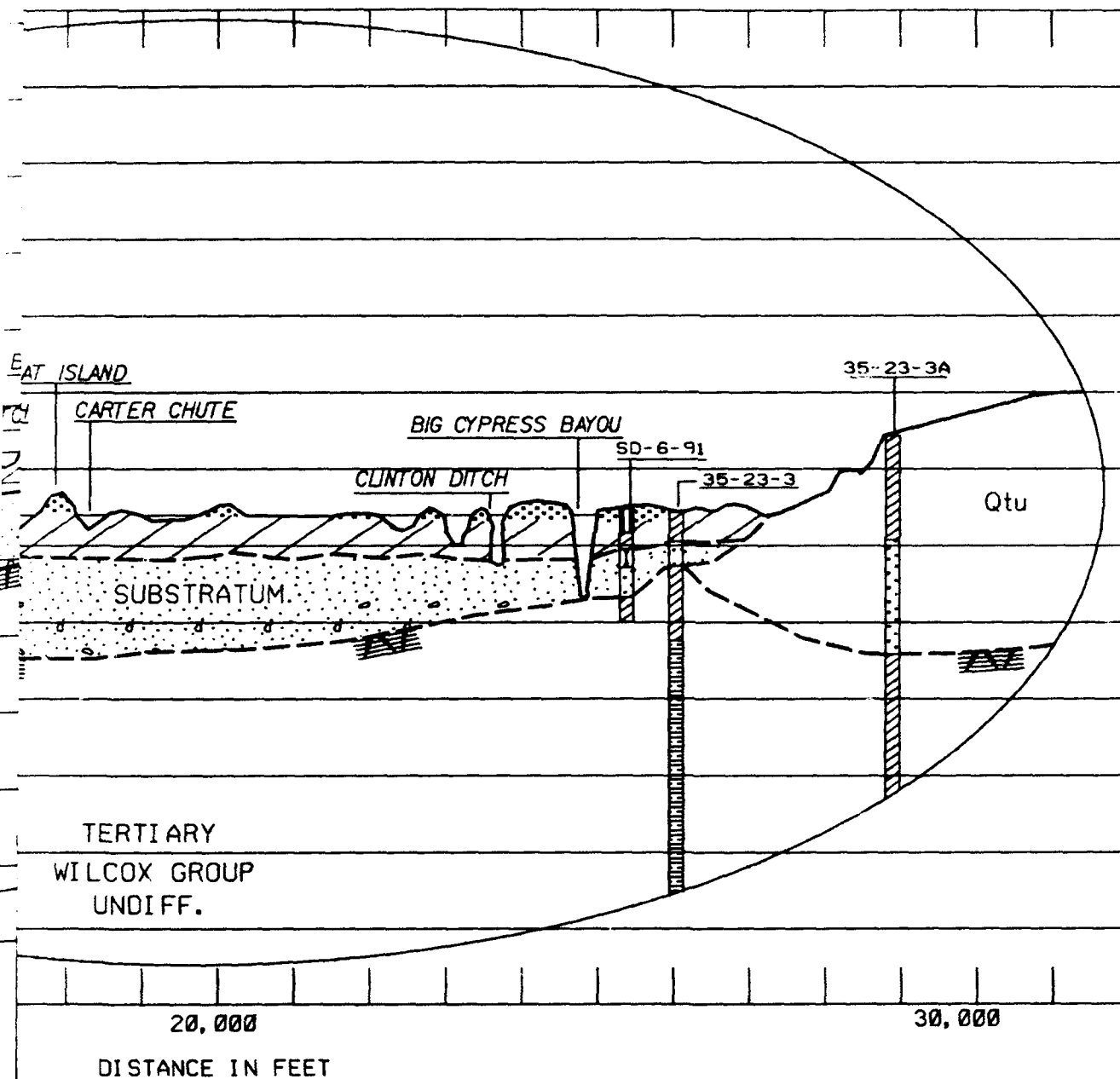
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SHREVEPORT , LA - DAINGERFIELD , TX

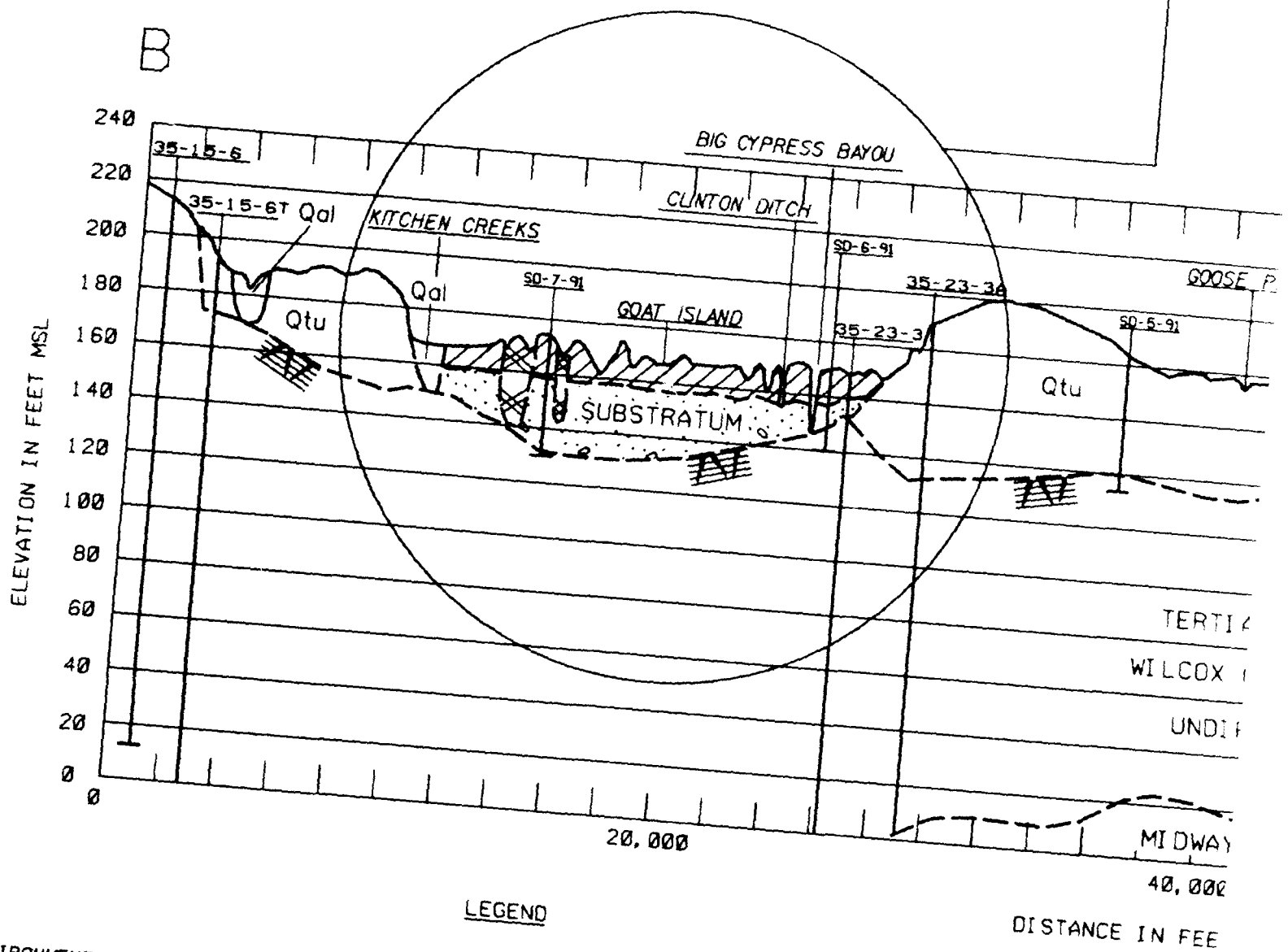
SECTION A - A'

CADDO

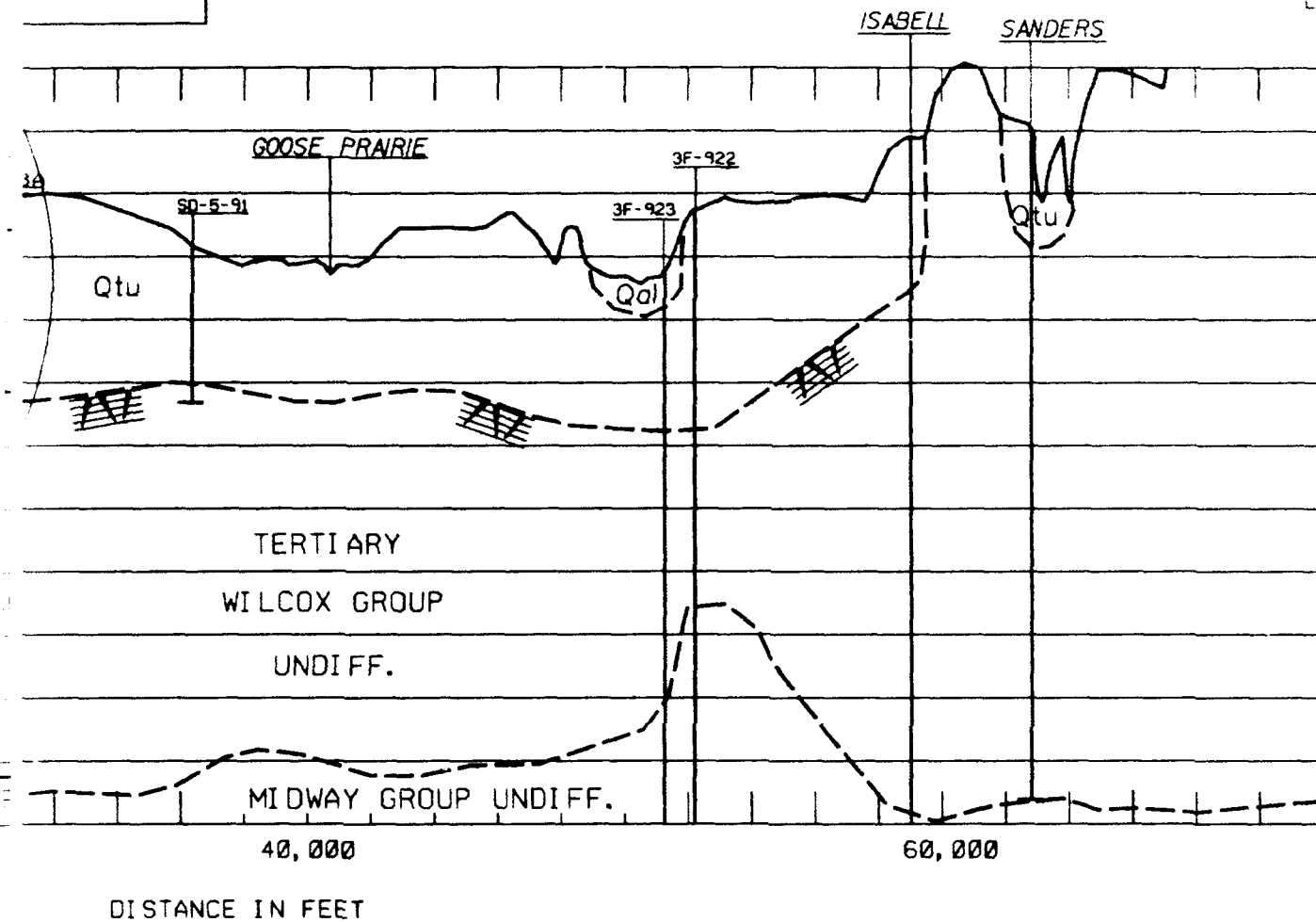
(HIGHWAY 43)





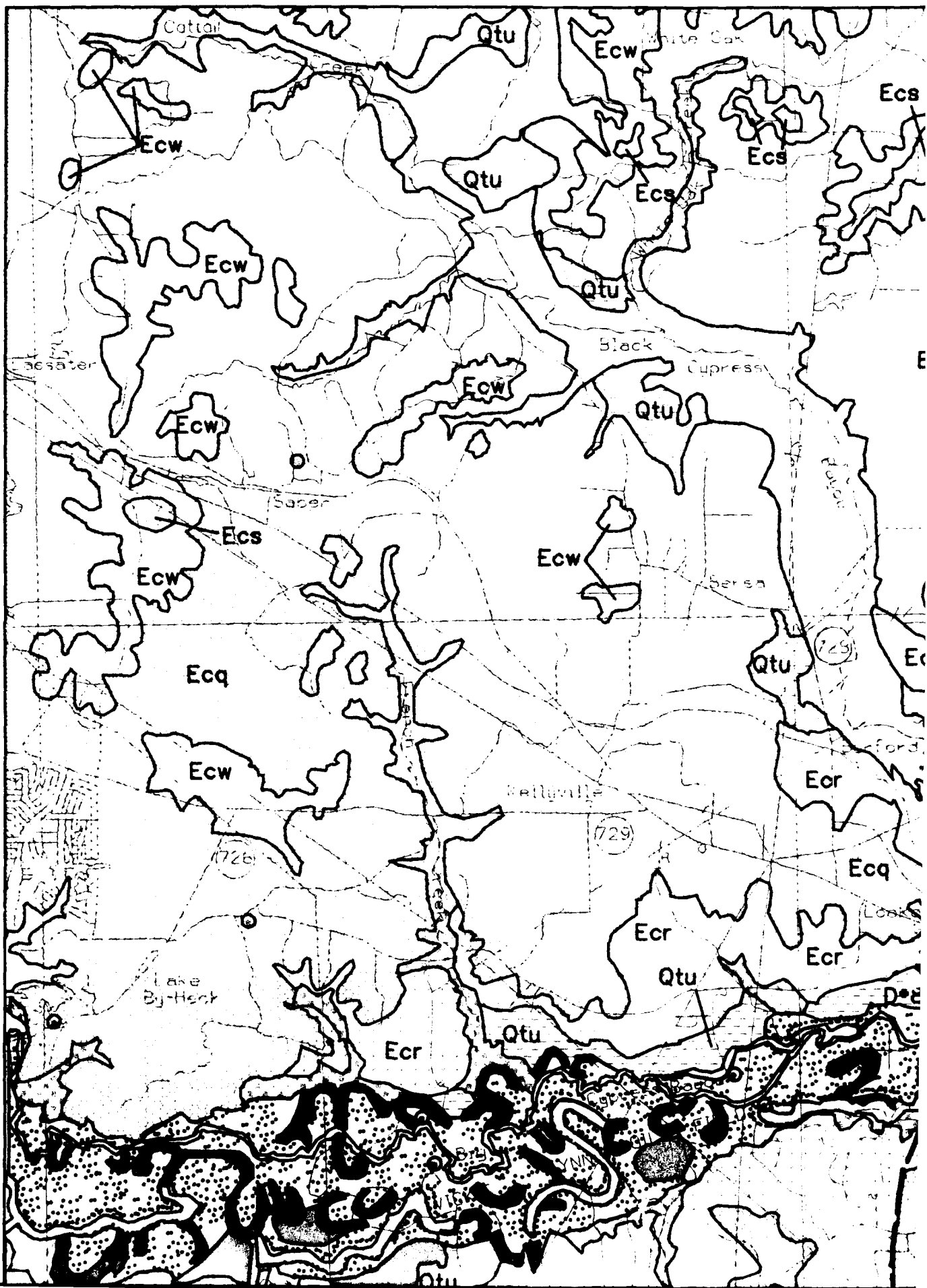


B'



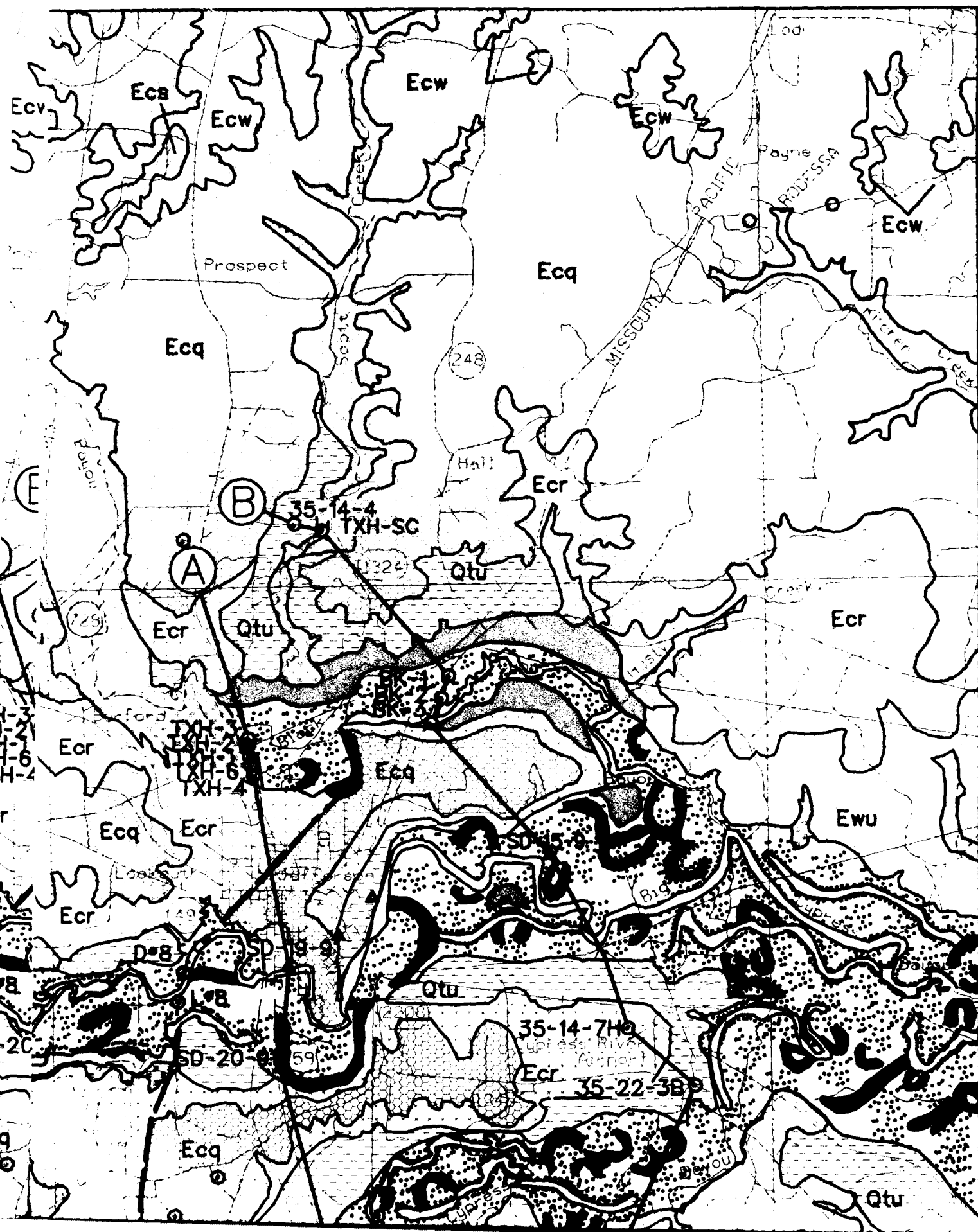
GEOLOGICAL INVESTIGATION  
 SHREVEPORT , LA - DAINGERFIELD , TX  
 SECTION B - B'  
 CADDO  
 (LONGHORN)

94° 30'  
32° 52'30"

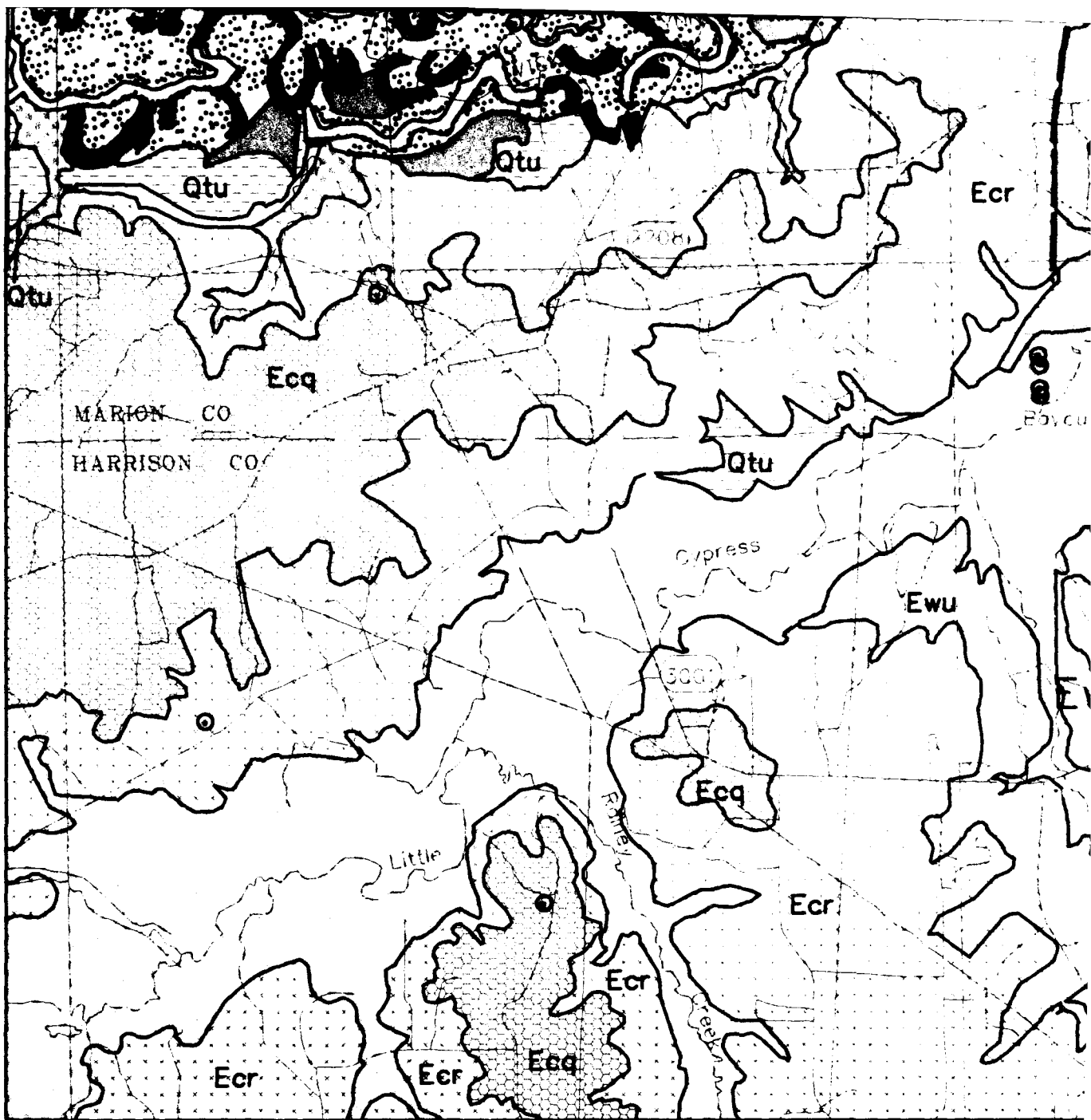


94° 15'

32° 52'









32° 37' 30"  
94° 30'



# LEGEND

## QUATERNARY

### RECENT

-  NATURAL LEVEE
-  POINT BAR
-  BACKSWAMP
-  ABANDONED CHANNEL
-  ABANDONED COURSE
-  UNDIFFERENTIATED ALLUVIUM






### PLEISTOCENE





-  UNDIFFERENTIATED TERRACE DEPOSITS

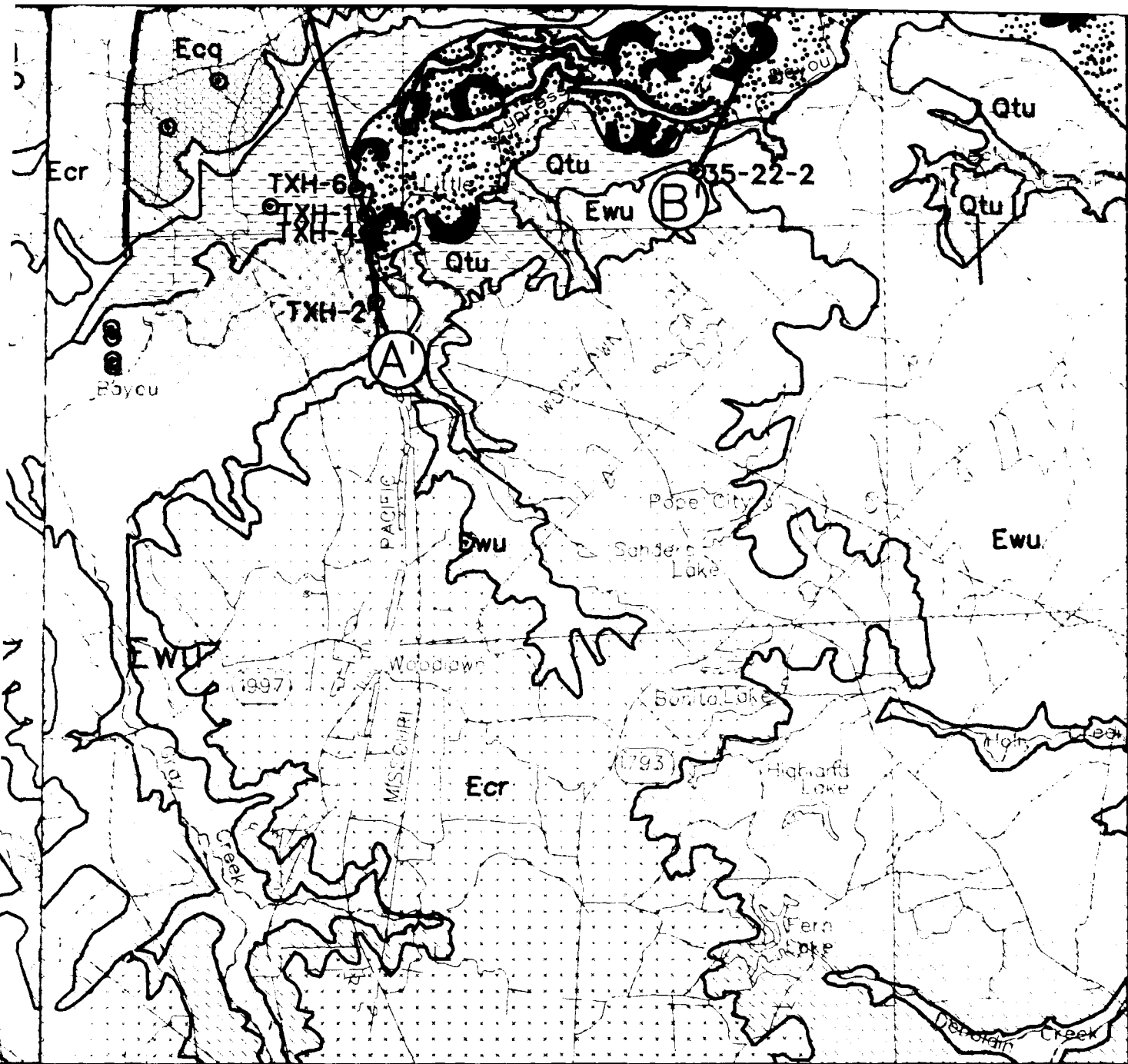
## TERTIARY

### EOCENE

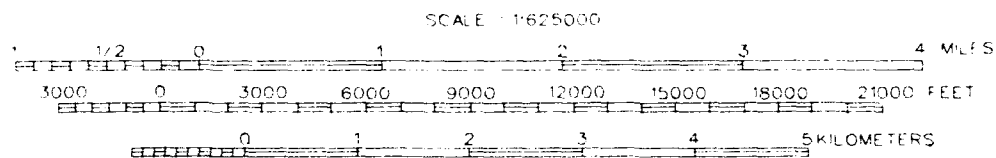
#### CLAIBORNE GROUP

-  SPARTA FORMATION
-  WECHES FORMATION
-  QUEEN CITY FORMATION
-  REKLAW FORMATION
-  WILCOX GROUP UNDIFFERENTIATED

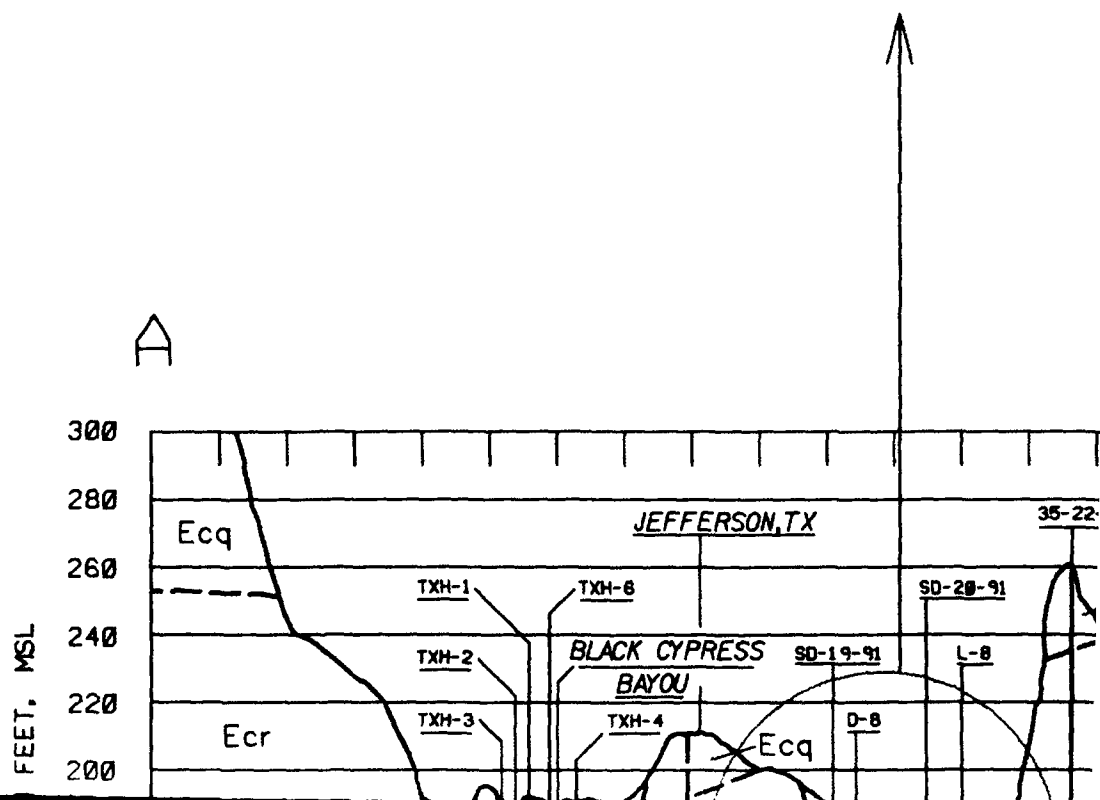
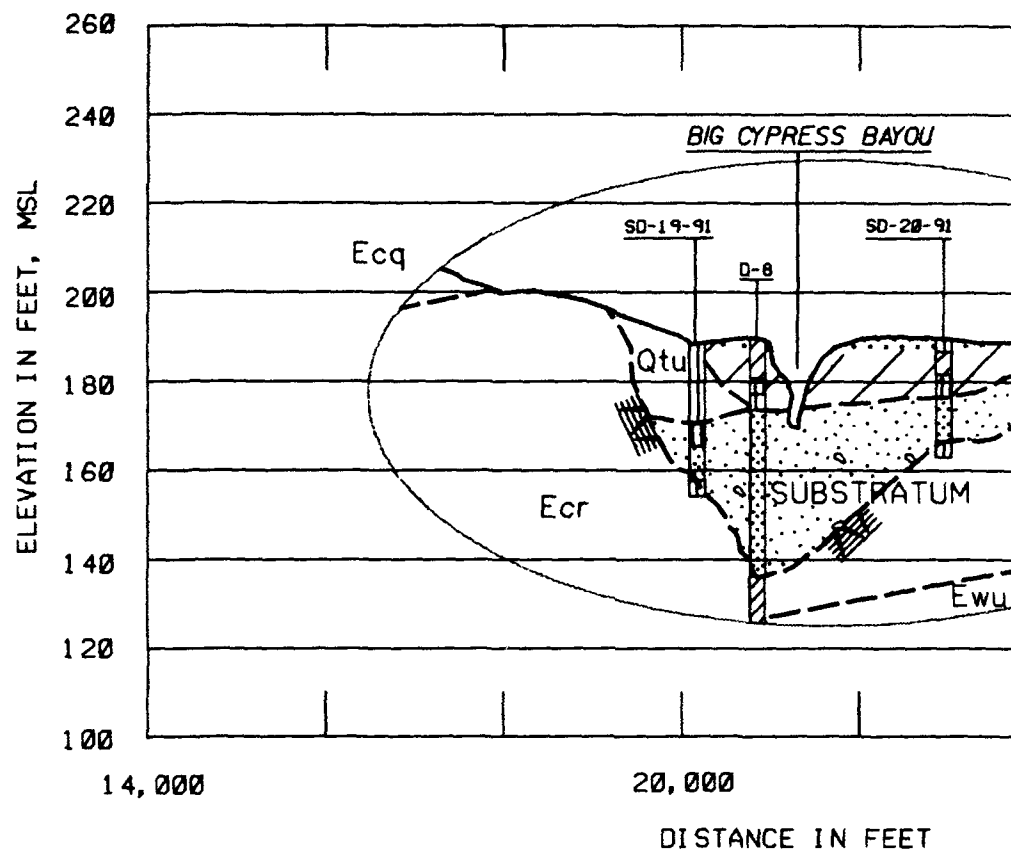
-  CONTACT
-  FAULT
-  BORING
-  PIEZOMETER



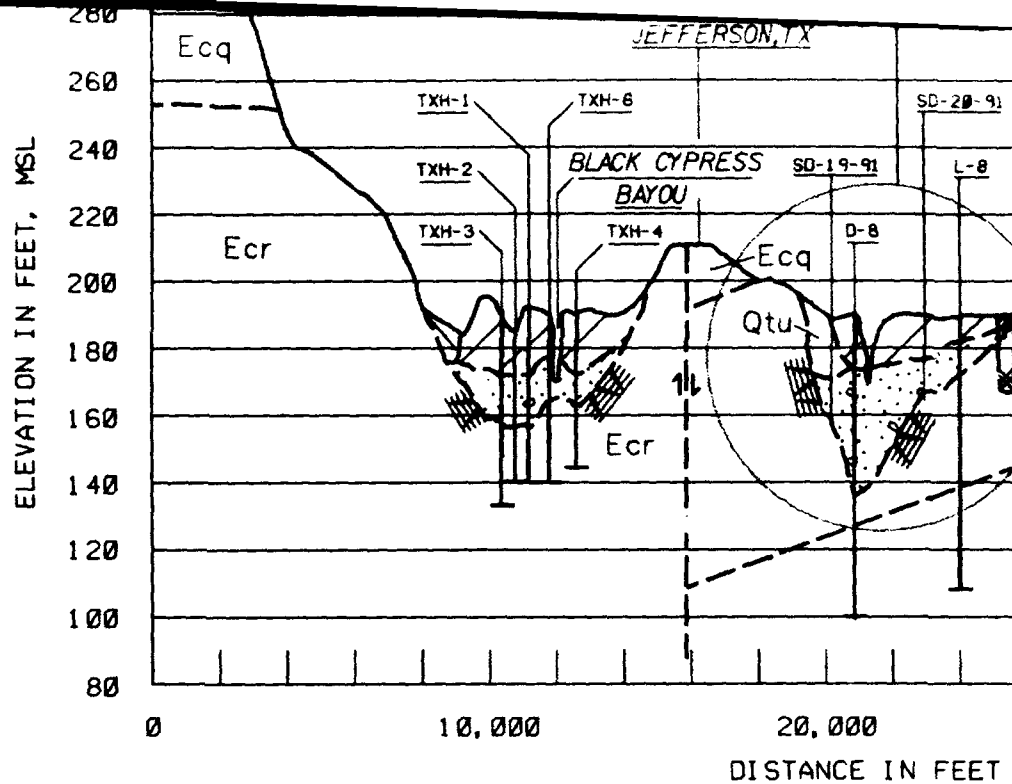
32° 37' 30"  
94° 15'



SHREVEPORT, LA - DANGERFIELD, TX  
SURFACE GEOLOGY  
JEFFERSON, TX  
2/92







### LEGEND

#### ENVIRONMENTS OF DEPOSITION

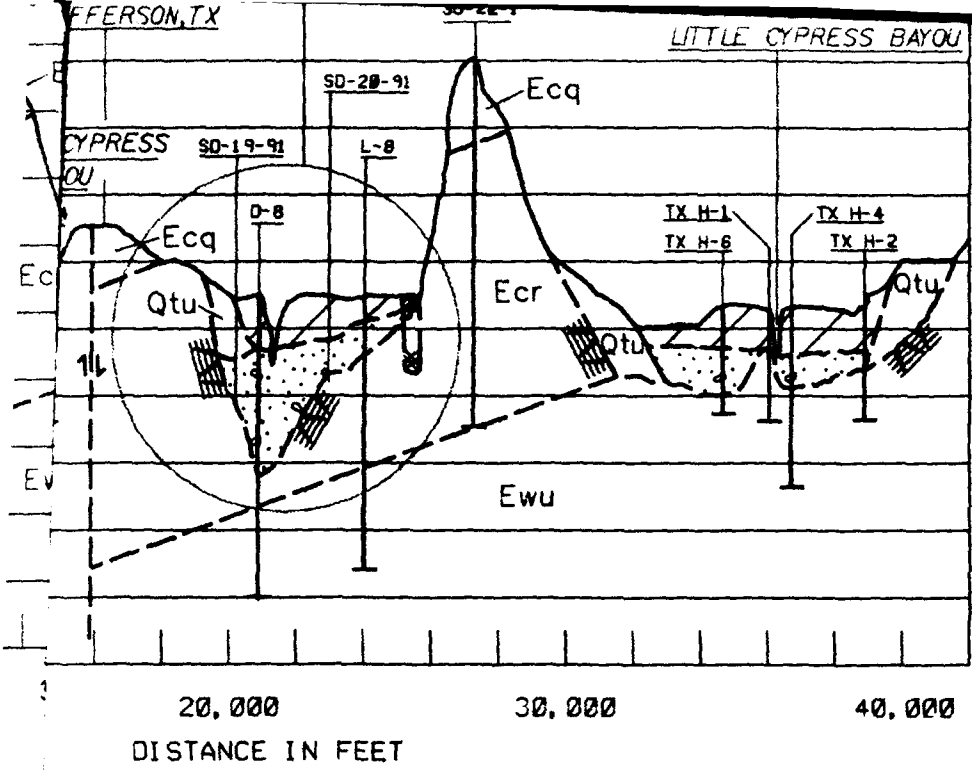
	NATURAL LEVEE
	POINT BAR
	BACKSWAMP
	ABANDONED CHANNEL
	ABANDONED COURSE

#### LITHOLOGY

	UNDIFFERENTIATED SAND AND GRAVEL
	SAND
	SILTY SAND
	SILT
	SANDY CLAY
	CLAY
	SHALE
	FILL

#### MAPPING SYMBOLS

	ALLUVIUM UNDIFF.
	TERRACE DEPOSITS UNDIFF.
	TERTIARY SURFACE
	SPARTA
	WECHES
	QUEEN CITY
	REKLAW
	WILCOX UNDIFF.



SYMBOLS

- VIUM
- FF.
- ACE DEPOSITS
- FF.
- TIARY SURFACE
- RTA
- HES
- EN CITY
- SLAW
- COX UNDIFF.

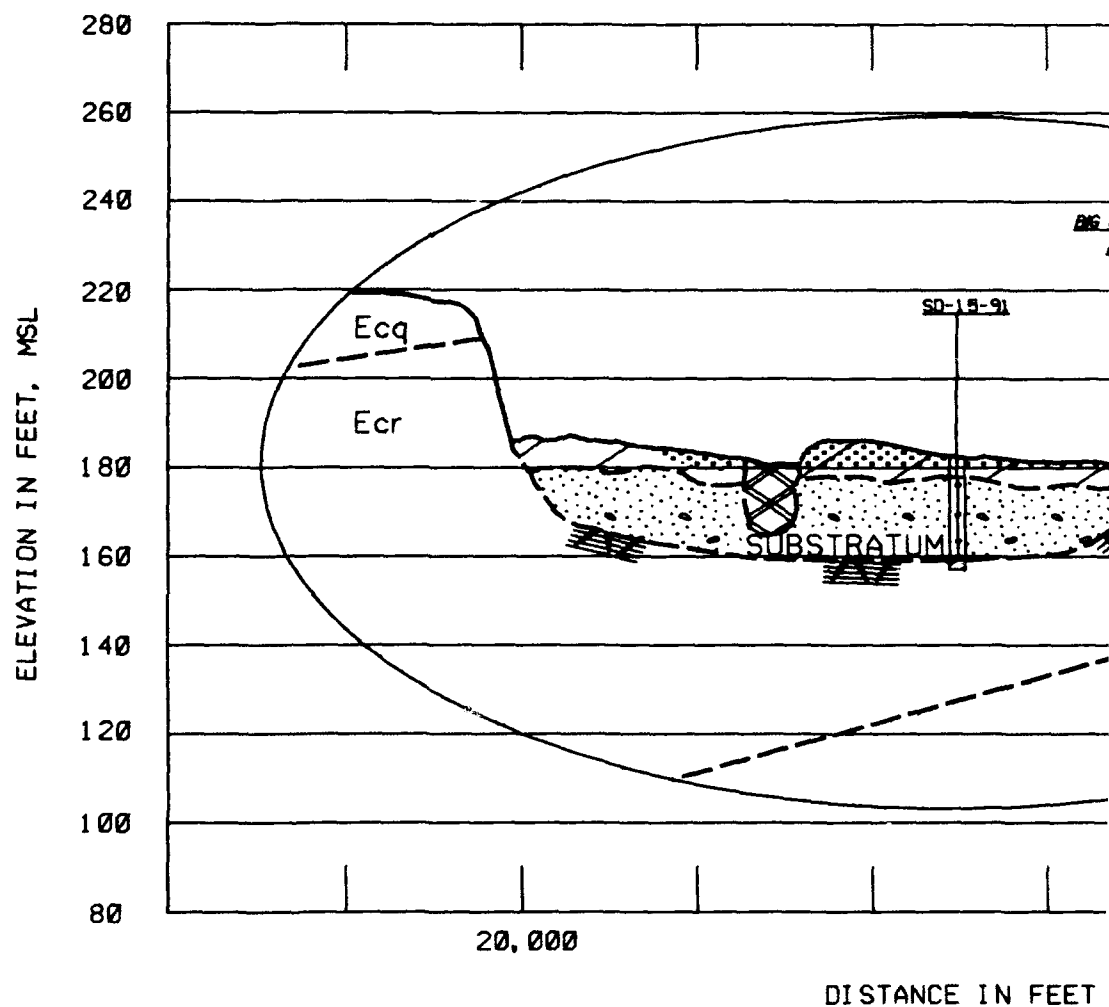
GEOLOGICAL INVESTIGATION

SHREVEPORT , LA - DAINGERFIELD , TX

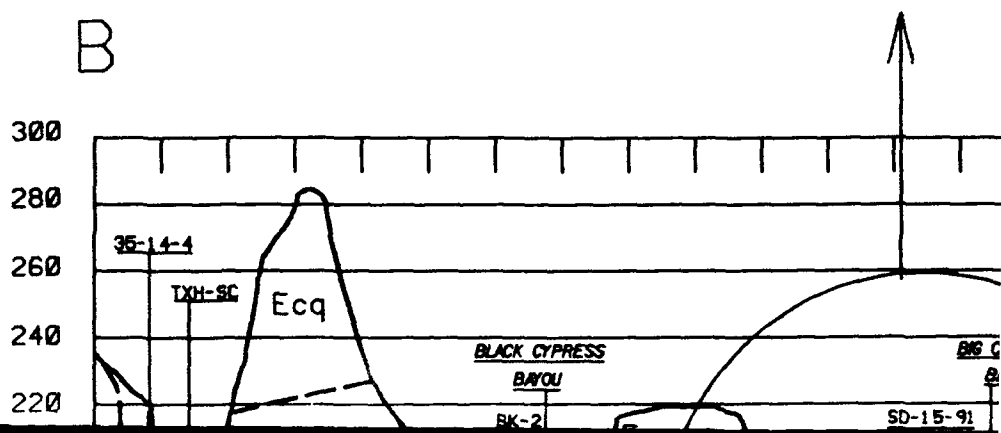
SECTION A - A'

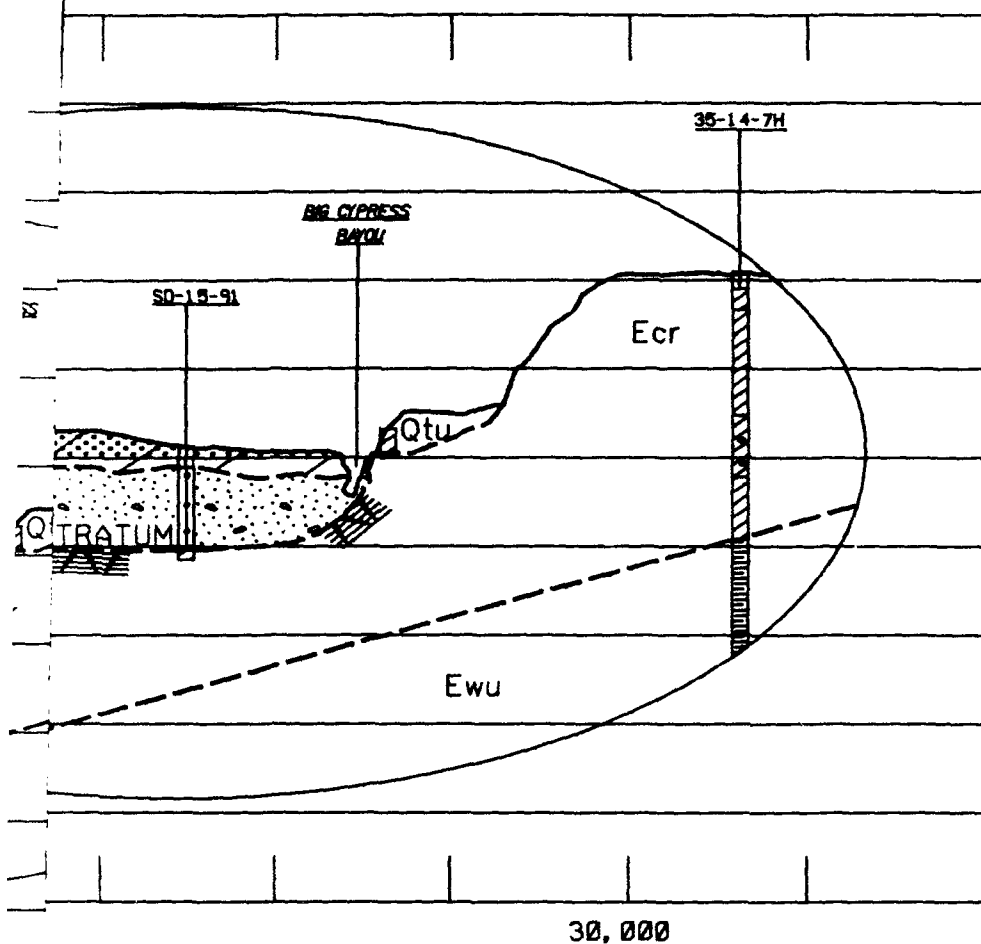
JEFFERSON

(HIGHWAY 59)

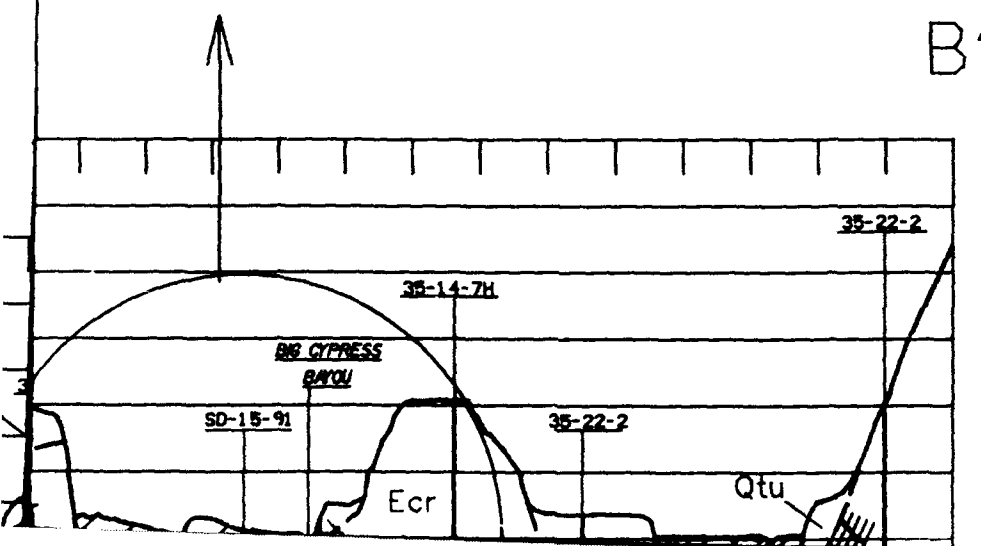


B

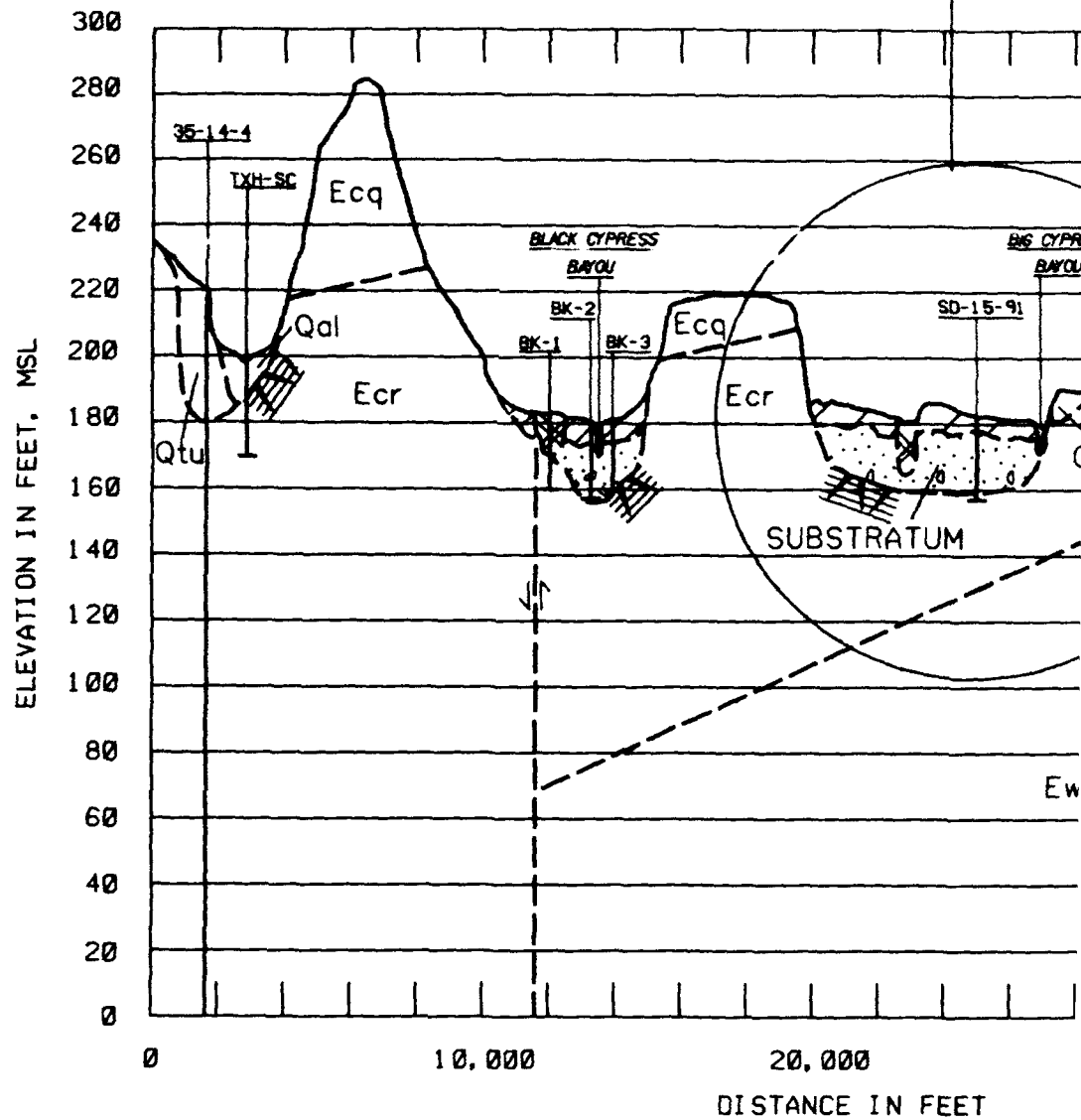




DISTANCE IN FEET



B



# LEGEND

## ENVIRONMENTS OF DEPOSITION

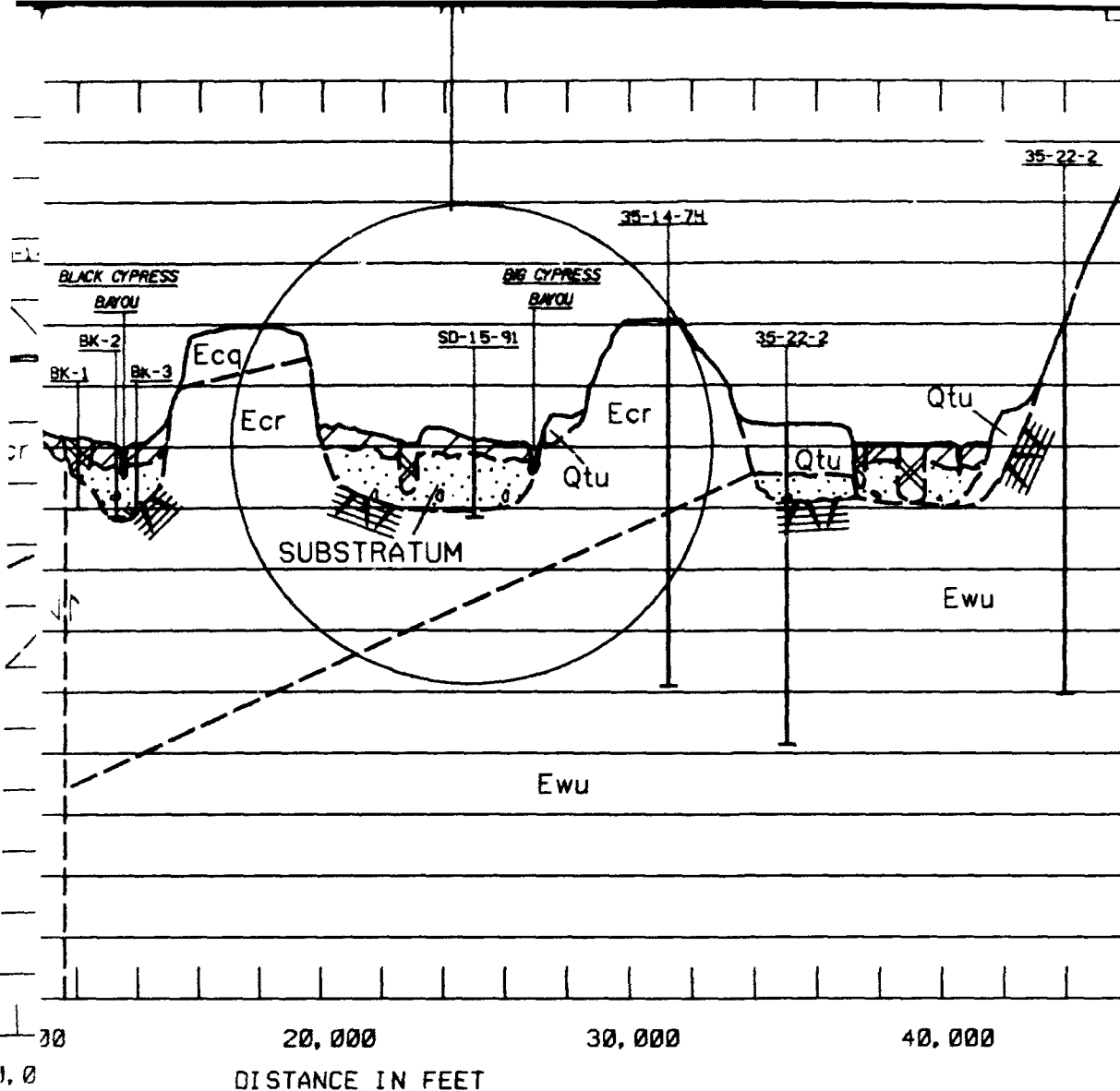
- NATURAL LEVEE
- POINT BAR
- BACKSWAMP
- ABANDONED CHANNEL
- ABANDONED COURSE
- UNDIFFERENTIATED SAND AND GRAVEL

## LITHOLOGY








- SAND
- SILTY SAND
- SILT
- SANDY CLAY
- CLAY
- SHALE

## MAPPING SYMBOLS

- TERRACE DEPOSITS UNDIFF.
- TERTIARY SURFACE
- SPARTA
- WECHES
- QUEEN CITY
- REKLAW
- WILCOX UNDIFF.

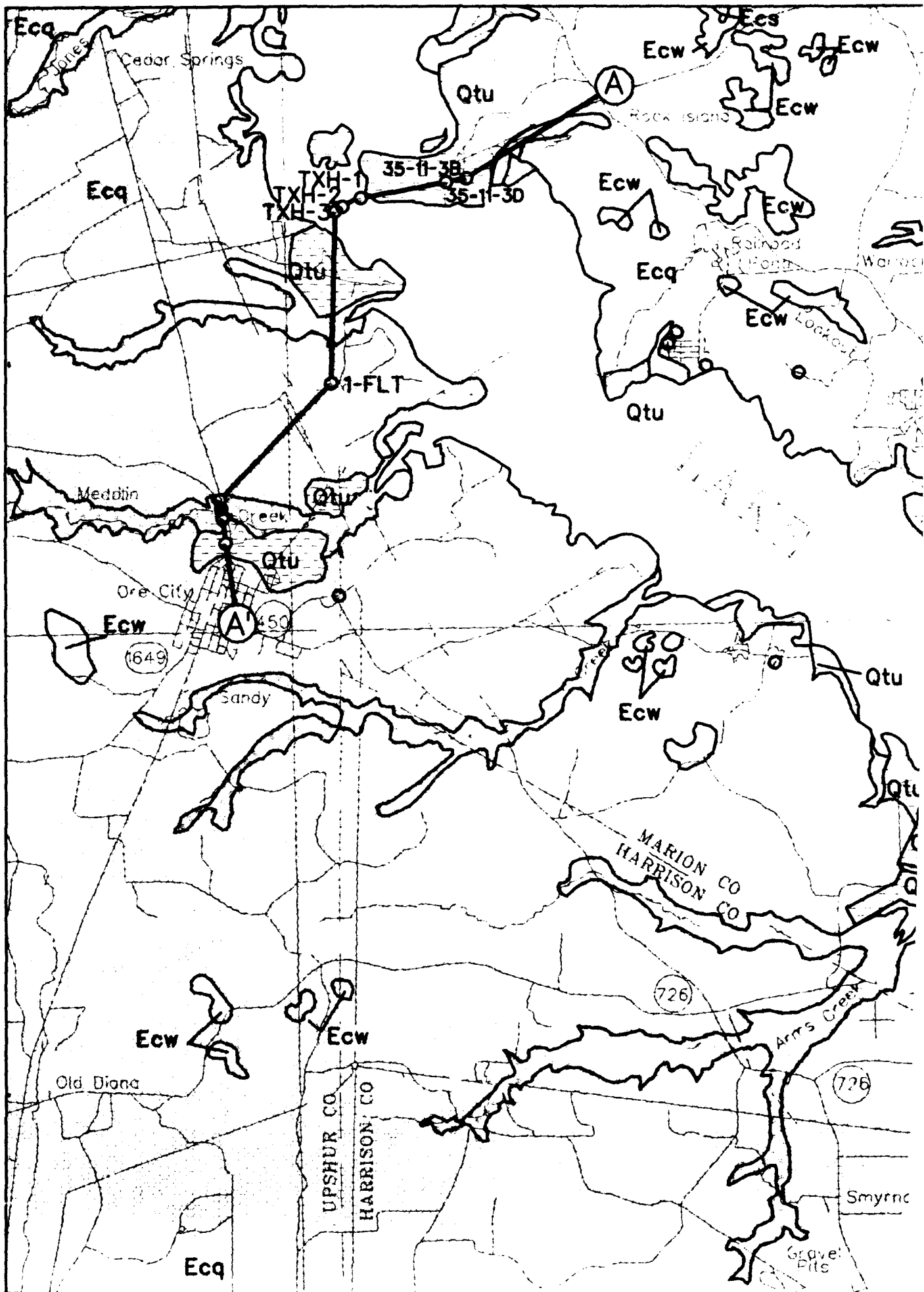


# MAPPING SYMBOLS

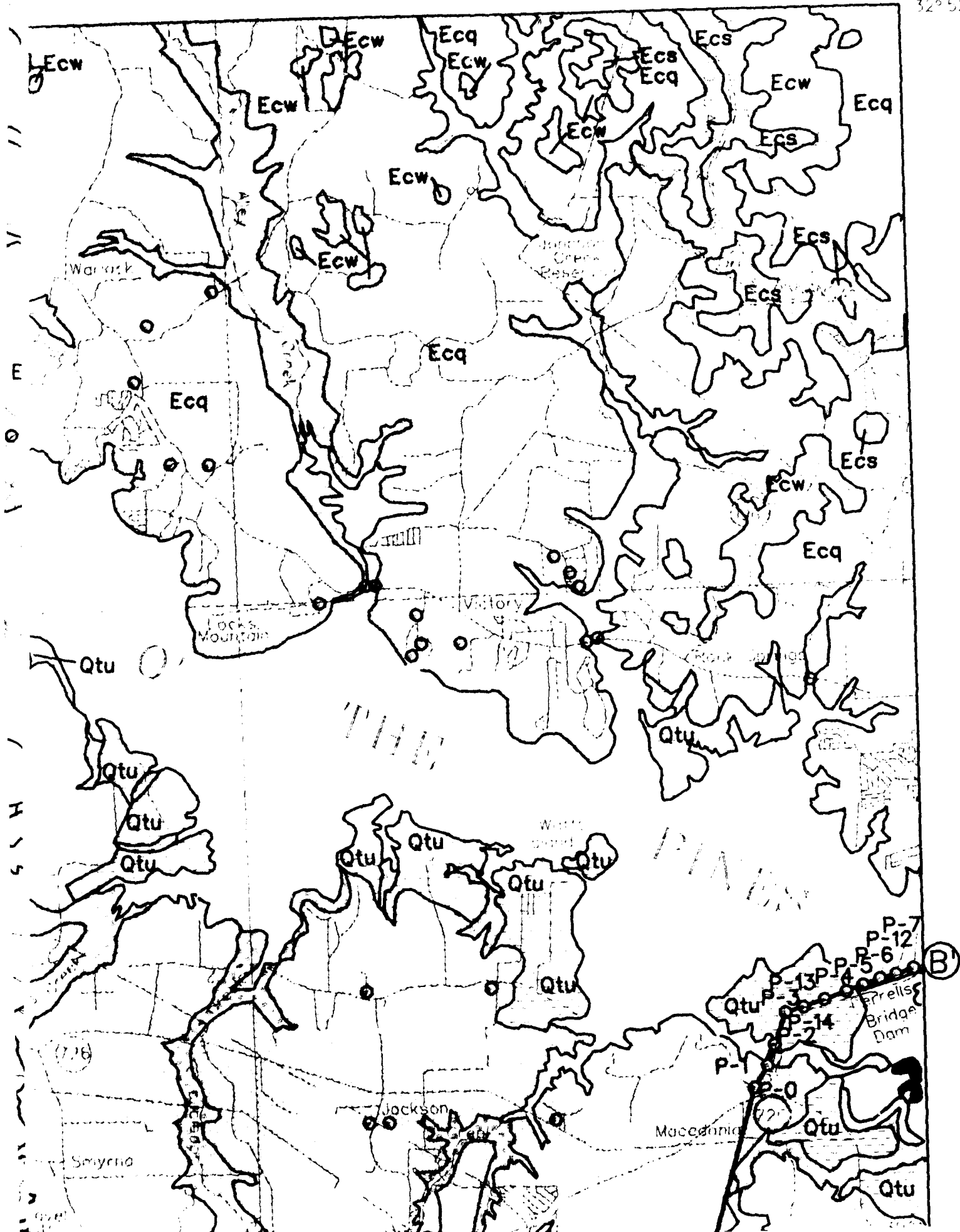
	TERRACE DEPOSITS UNDIFF.
	TERTIARY SURFACE
	SPARTA
	WECHES
	QUEEN CITY
	REKLAW
	WILCOX UNDIFF.

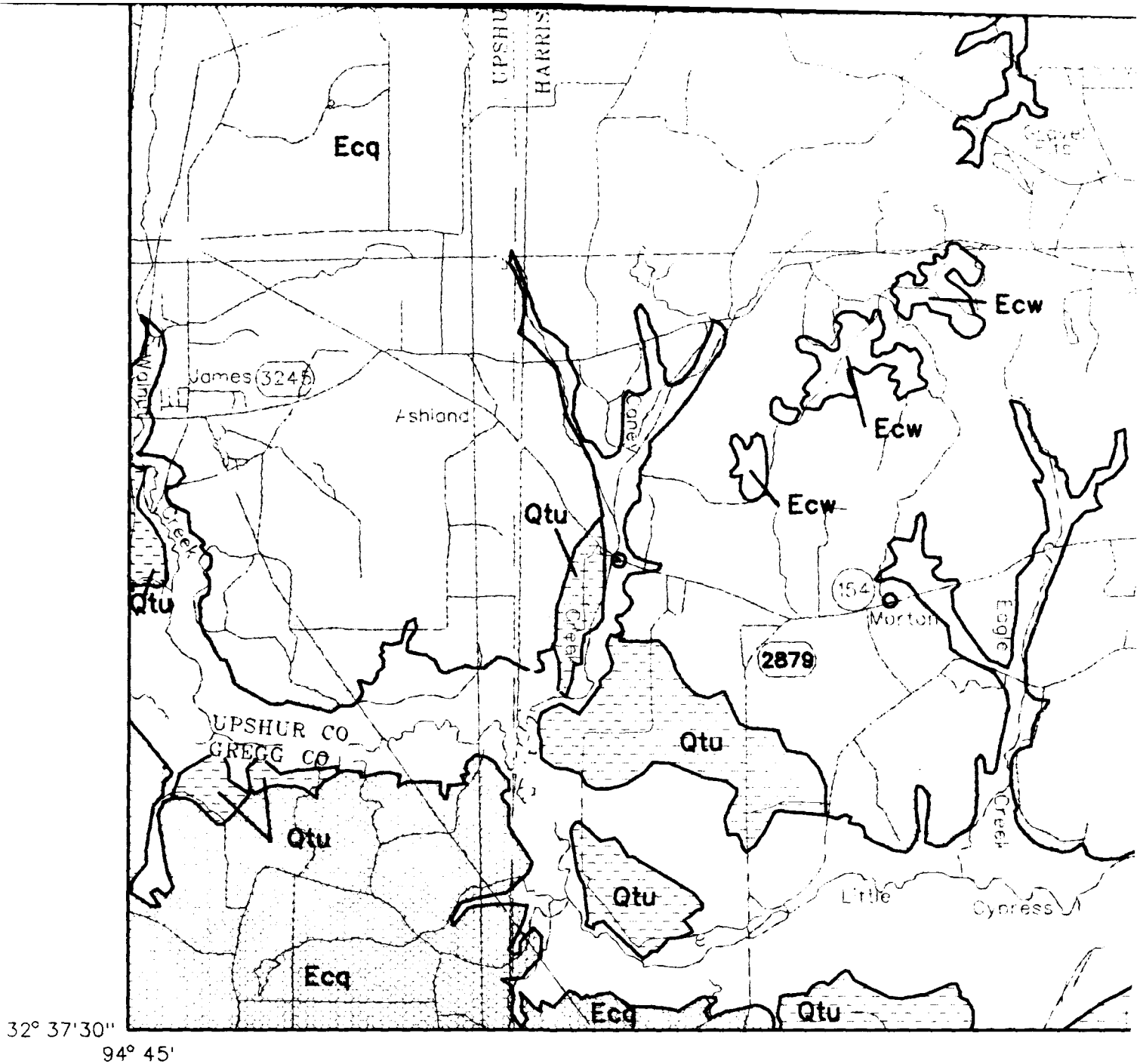
## GEOLOGICAL INVESTIGATION SHREVEPORT , LA - DAINGERFIELD , TX SECTION B - B' JEFFERSON ( WOODLAWN OIL FIELD)

32° 52' 30"



94° 30'  
32° 52' 30"






# LEGEND

## QUATERNARY

### RECENT

-  NATURAL LEVEE
-  POINT BAR
-  BACKSWAMP
-  ABANDONED CHANNEL
-  ABANDONED COURSE
-  UNDIFFERENTIATED ALLUVIUM






### PLEISTOCENE





-  UNDIFFERENTIATED TERRACE DEPOSITS

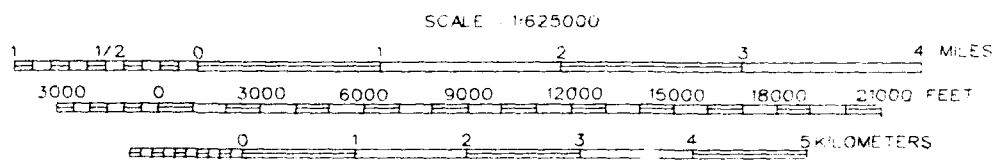
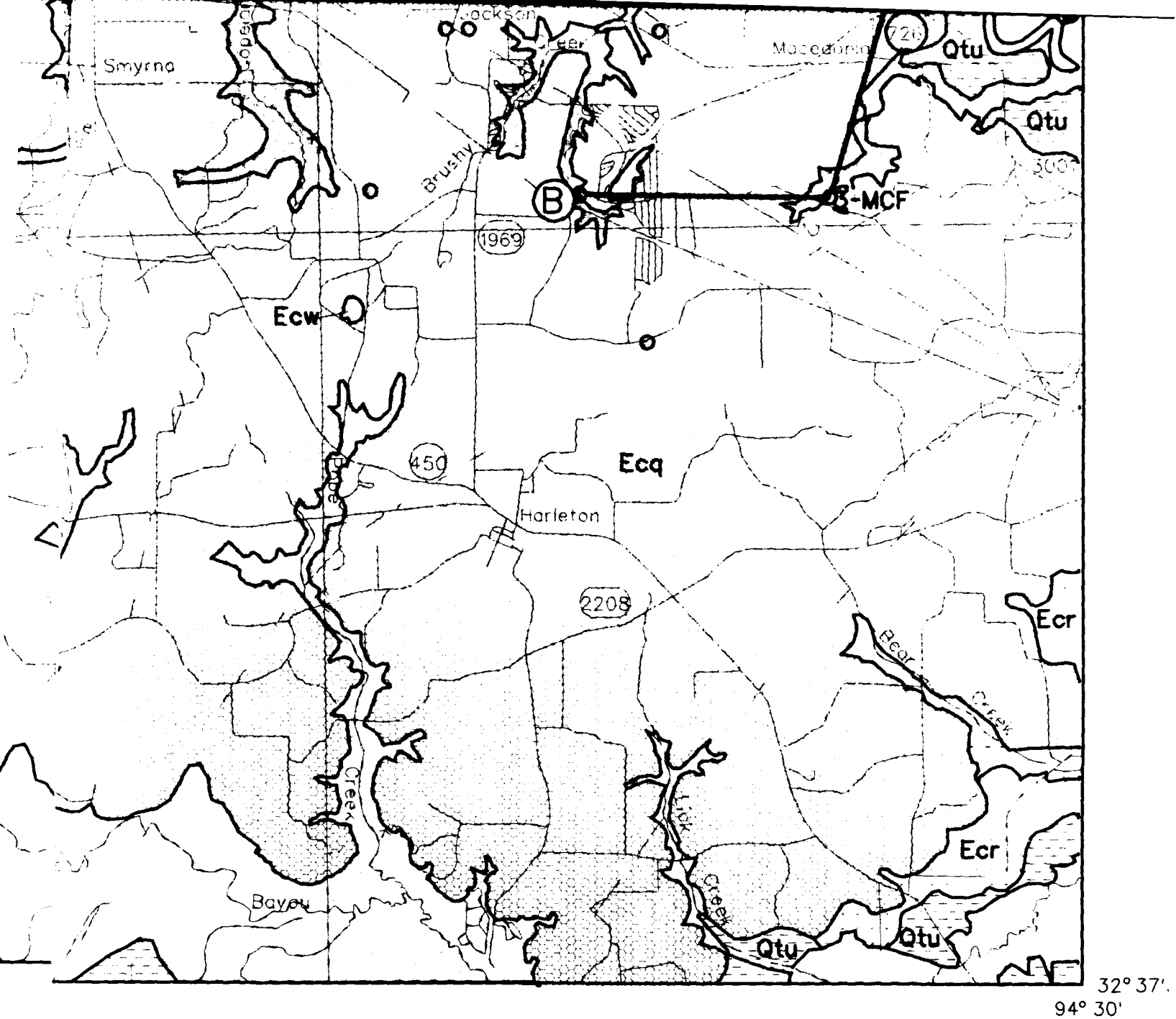
## TERTIARY

### EOCENE

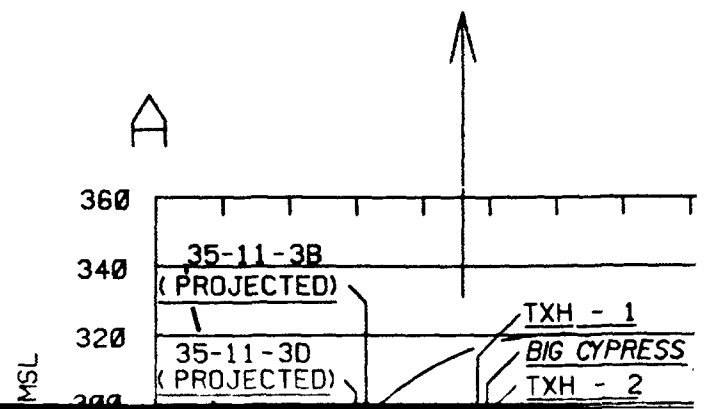
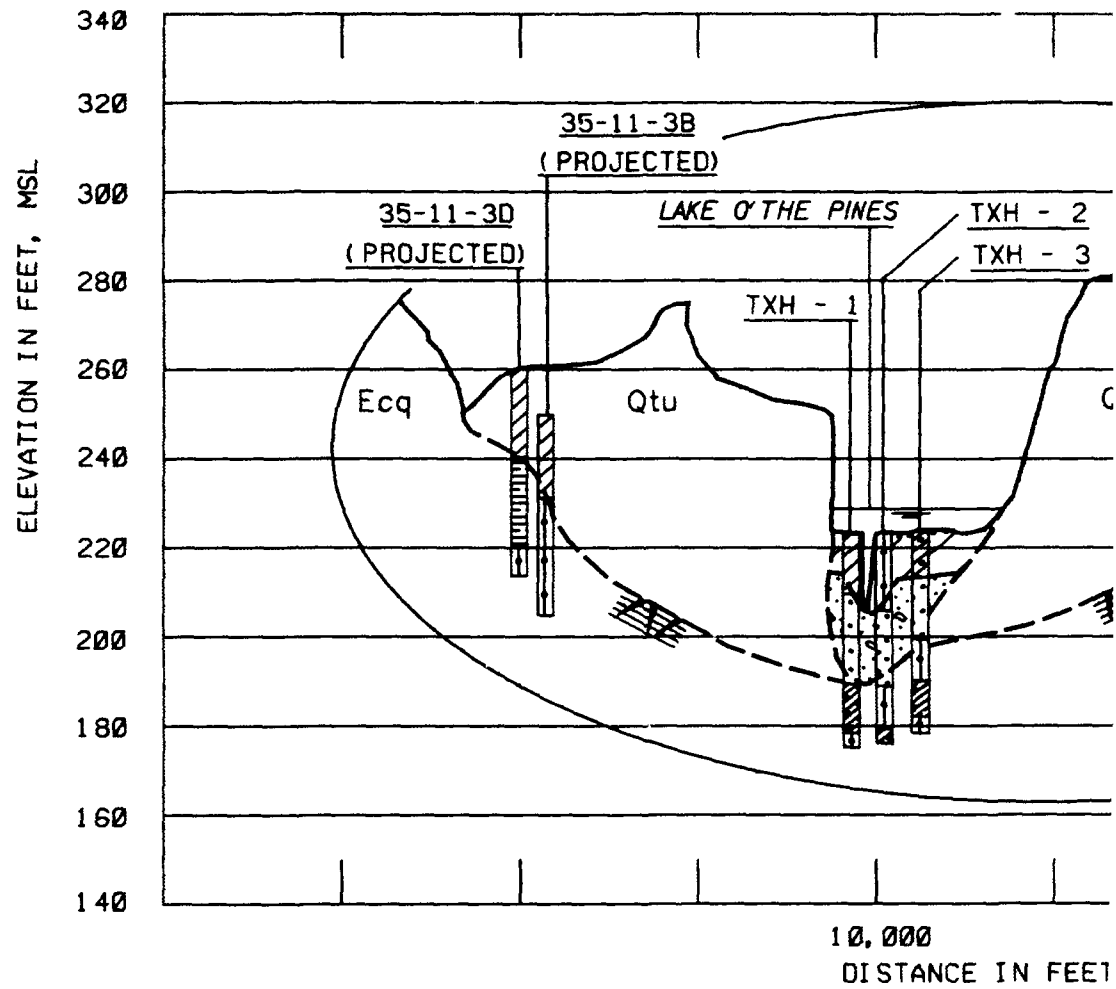
#### CLAIBORNE GROUP

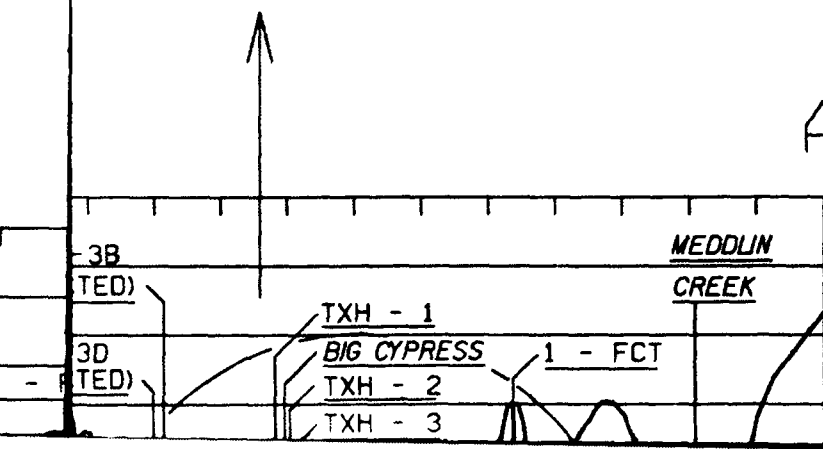
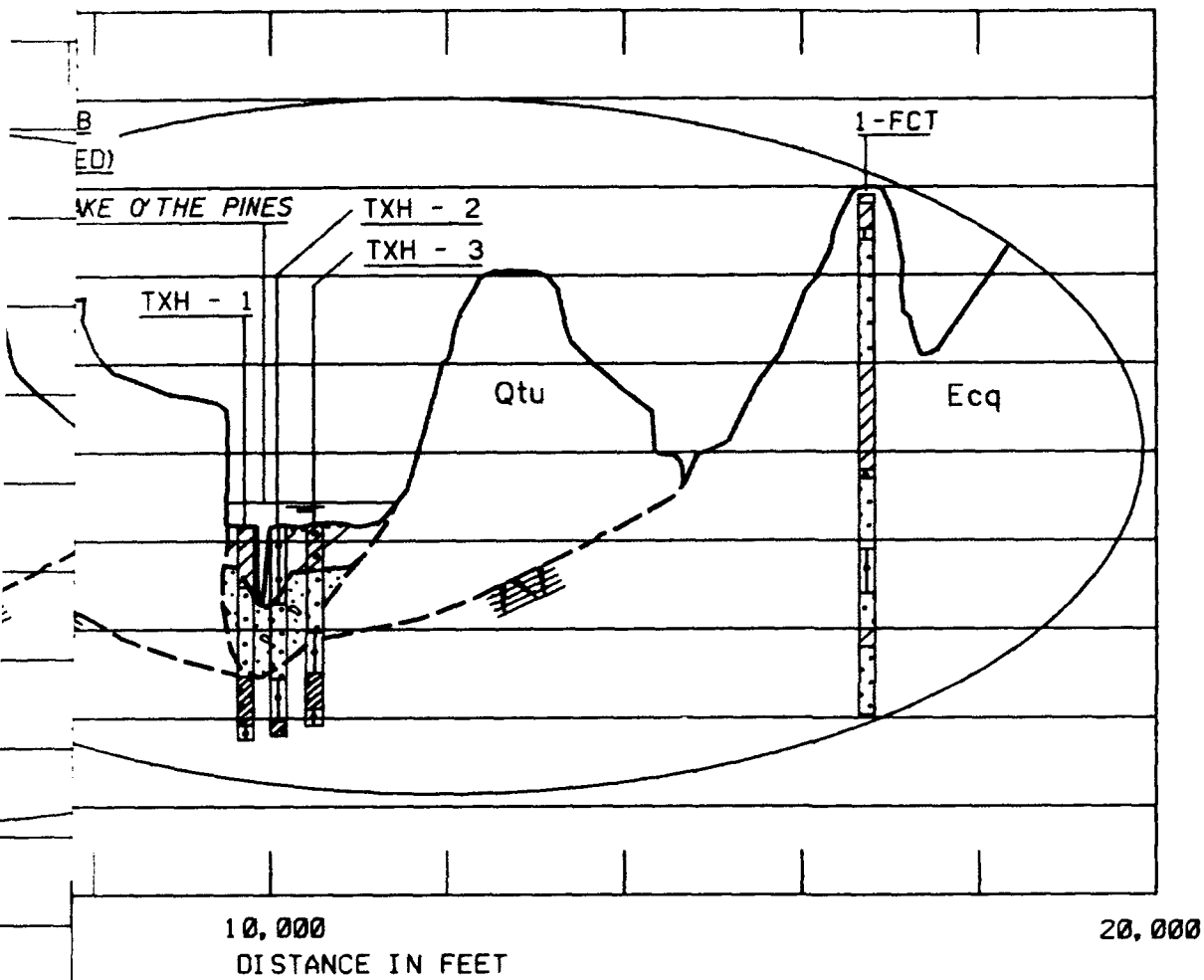
-  SPARTA FORMATION
-  WECHES FORMATION
-  QUEEN CITY FORMATION
-  REKLAW FORMATION
-  WILCOX GROUP UNDIFFERENTIATED

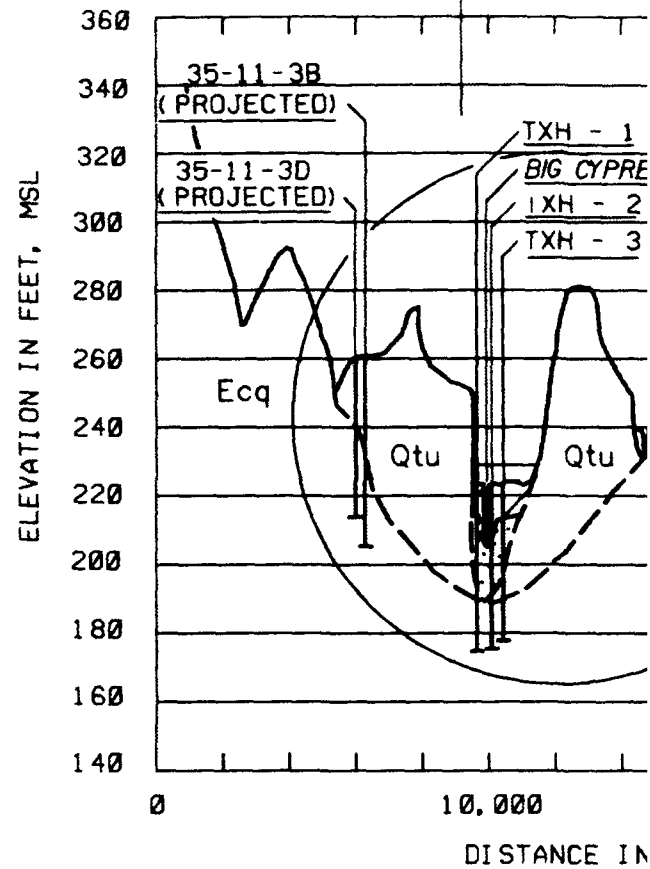
-  CONTACT
-  FAULT
-  BORING
-  PIEZOMETER



SHREVEPORT, LA - DAINGERFIELD, TX  
 SURFACE GEOLOGY  
 LAKE O' THE PINES, TX  
 2/92







### LEGEND

#### ENVIRONMENTS OF DEPOSITION

	NATURAL LEVEE
	POINT BAR
	BACKSWAMP
	ABANDONED CHANNEL
	ABANDONED COURSE

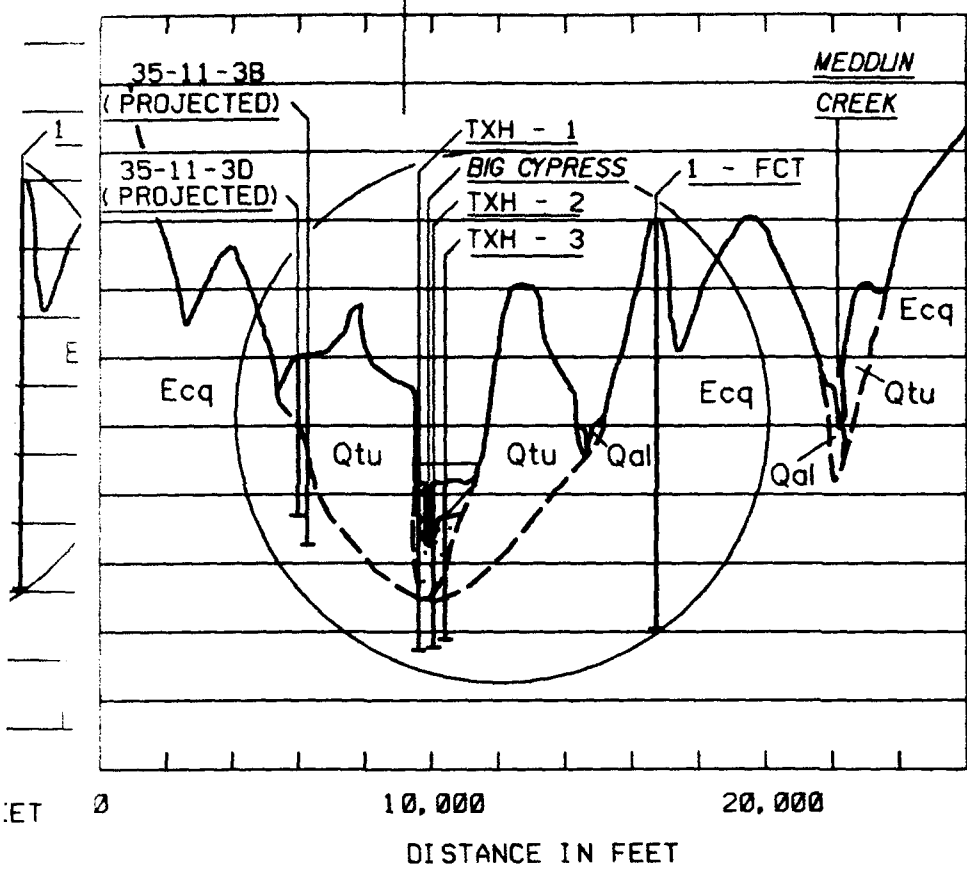
#### LITHOLOGY

	UNDIFFERENTIATED SAND AND GRAVEL
	SAND
	SILTY SAND
	SILT
	SANDY CLAY
	CLAY
	SHALE
	FILL

#### MAPPING SYMBOLS

	ALLUVIUM UNDIFF.
	TERRACE DEPOSITS UNDIFF.
	TERTIARY SURFACE
	SPARTA
	WECHES
	QUEEN CITY
	REKLAW
	WILCOX UNDIFF.

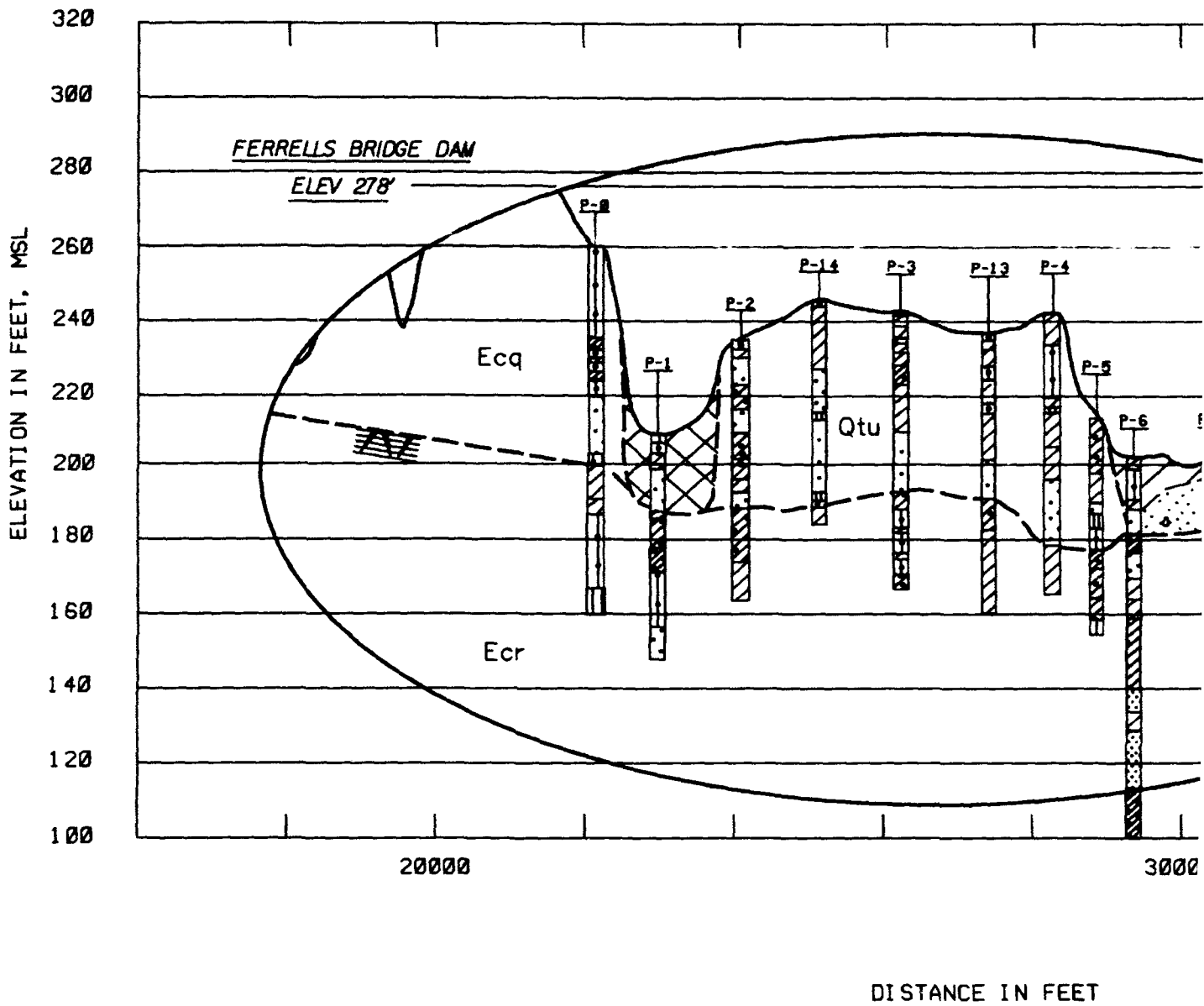
A'



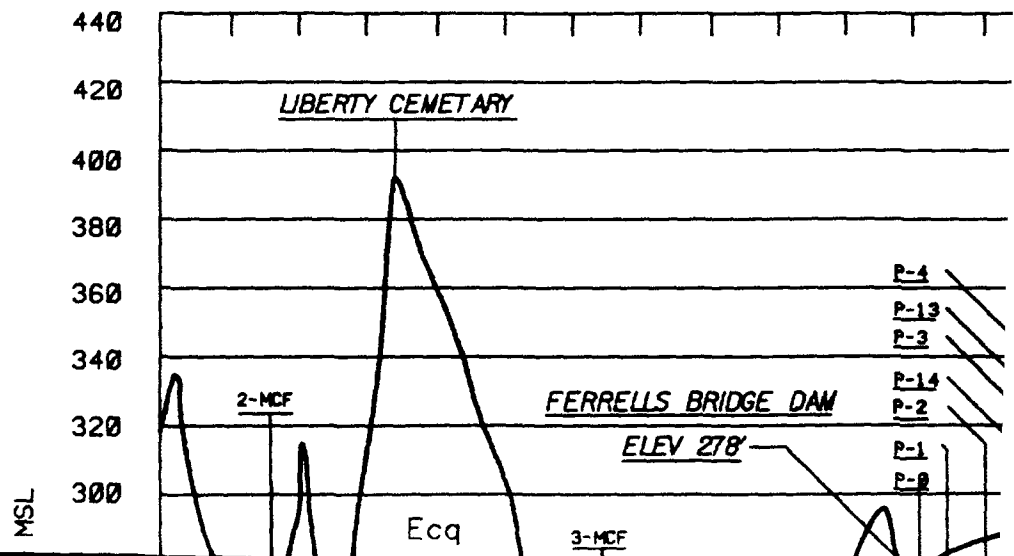
MAPPING SYMBOLS

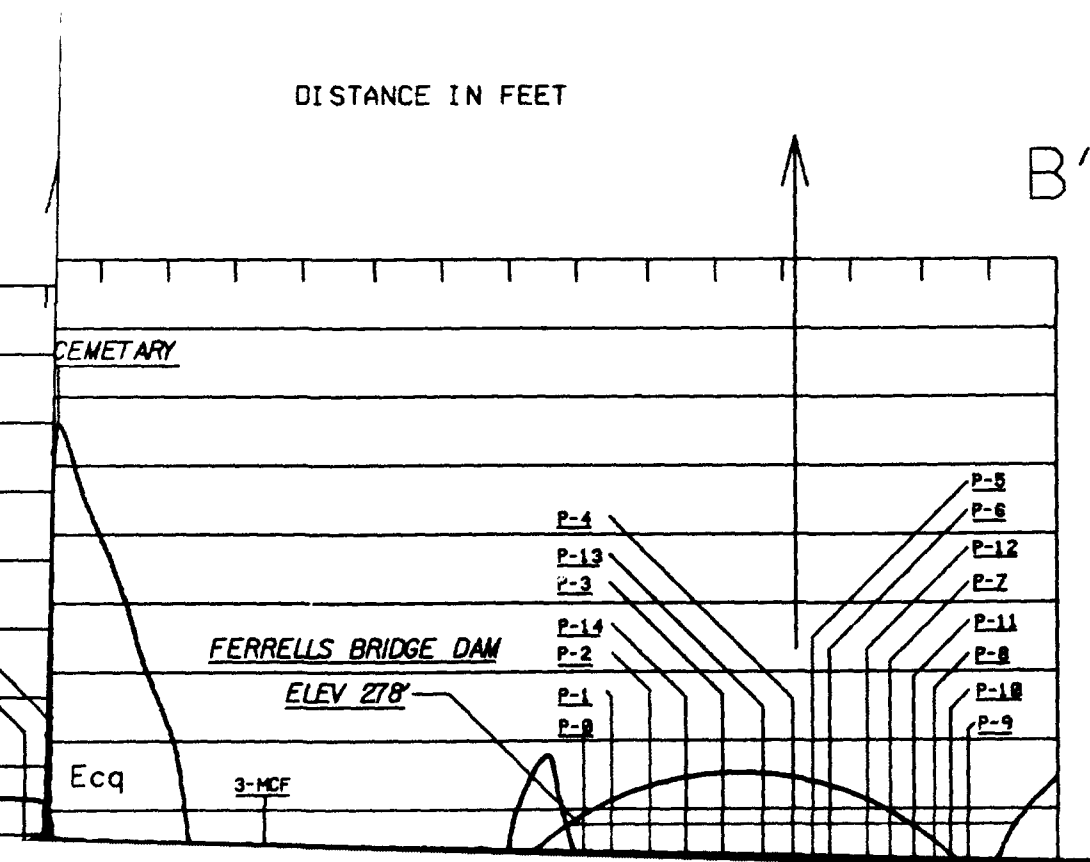
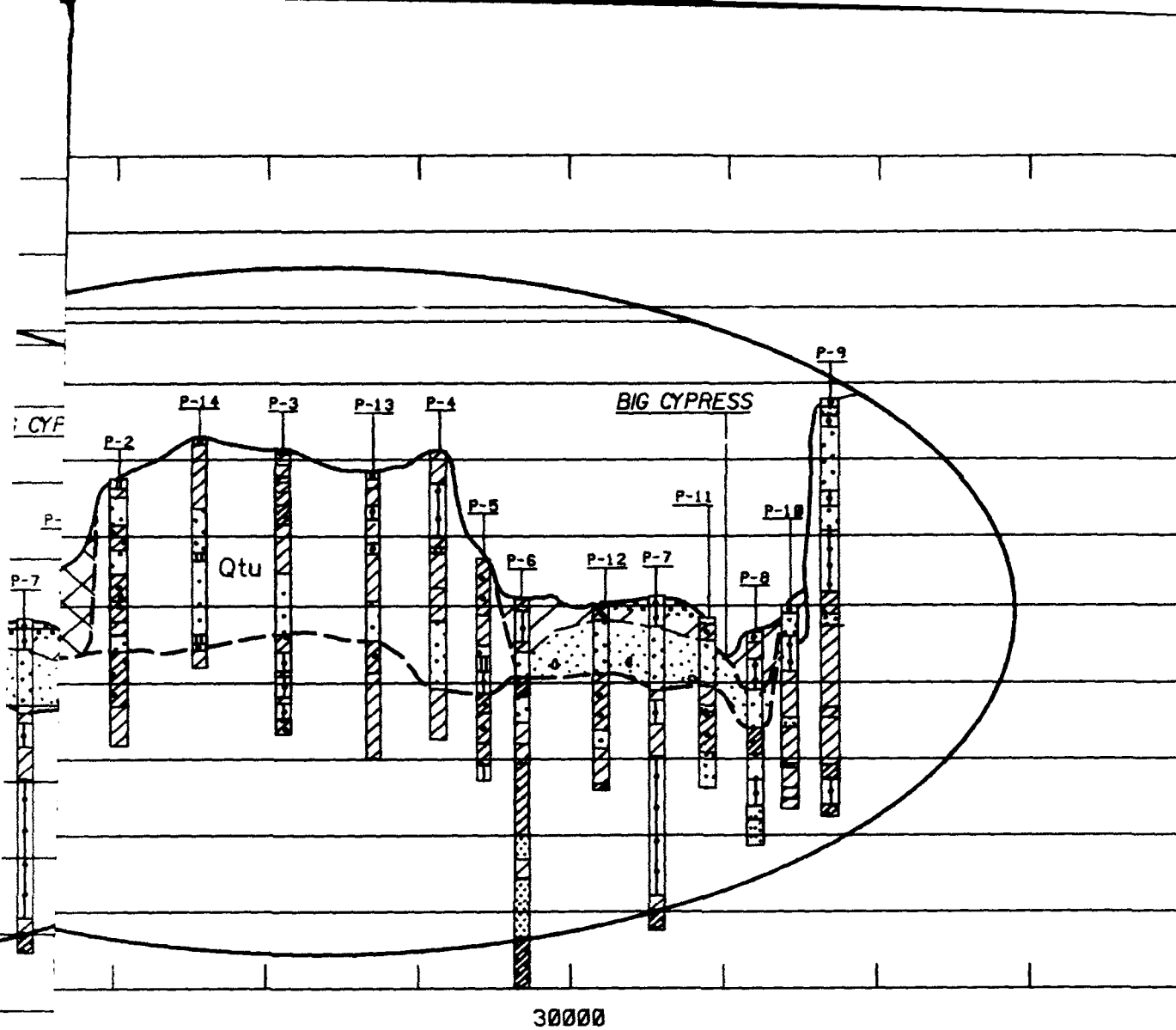
- Qal ALLUVIUM UNDIFF.
- Qtu TERRACE DEPOSITS UNDIFF.
- Tertiary Surface Symbol TERTIARY SURFACE
- Eos SPARTA
- Eow WECHES
- Eqc QUEEN CITY
- Eor REKLAU
- Ewu WILCOX UNDIFF.

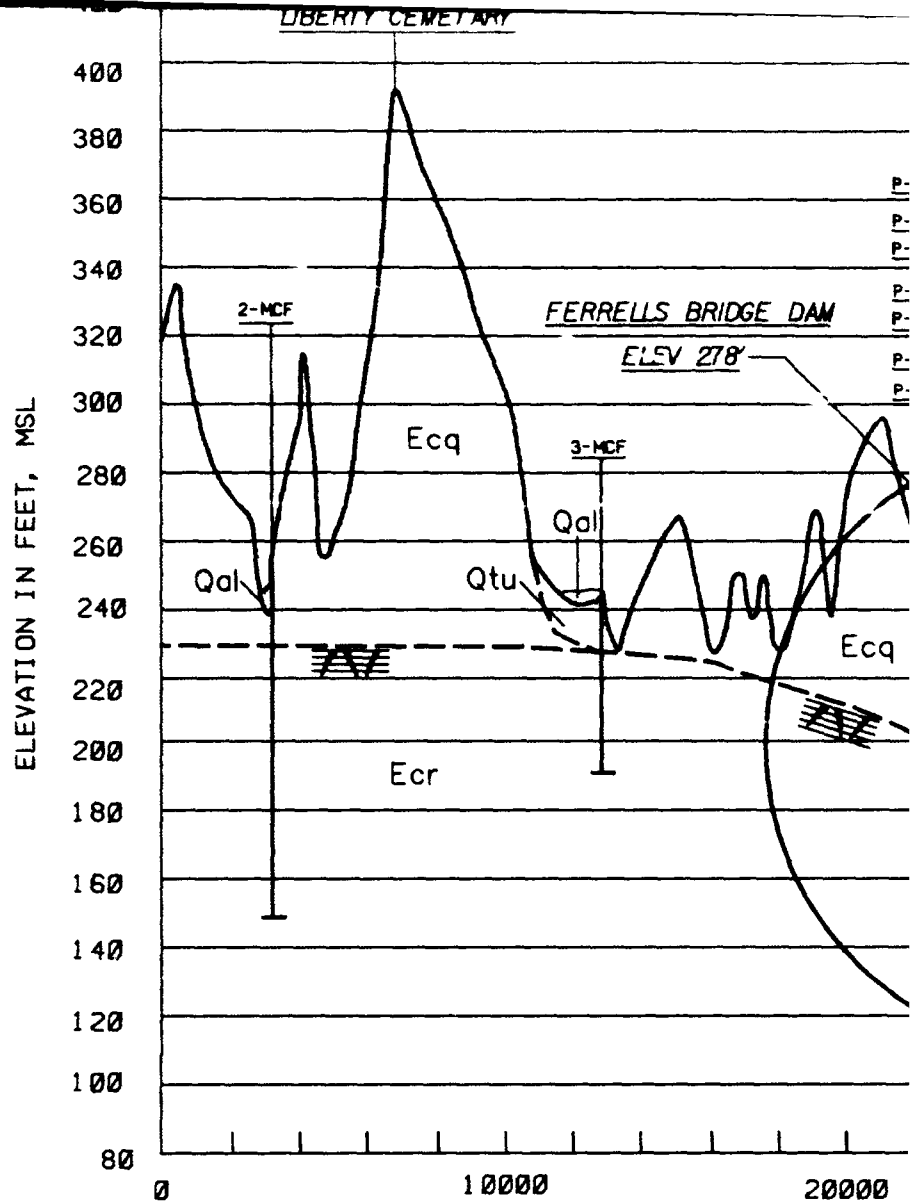
GEOLOGICAL INVESTIGATION  
 SHREVEPORT , LA - DAINGERFIELD , TX  
 SECTION A -A'  
 LAKE O' THE PINES  
 (ORE CITY)



B







### LEGEND

#### ENVIRONMENTS OF DEPOSITION

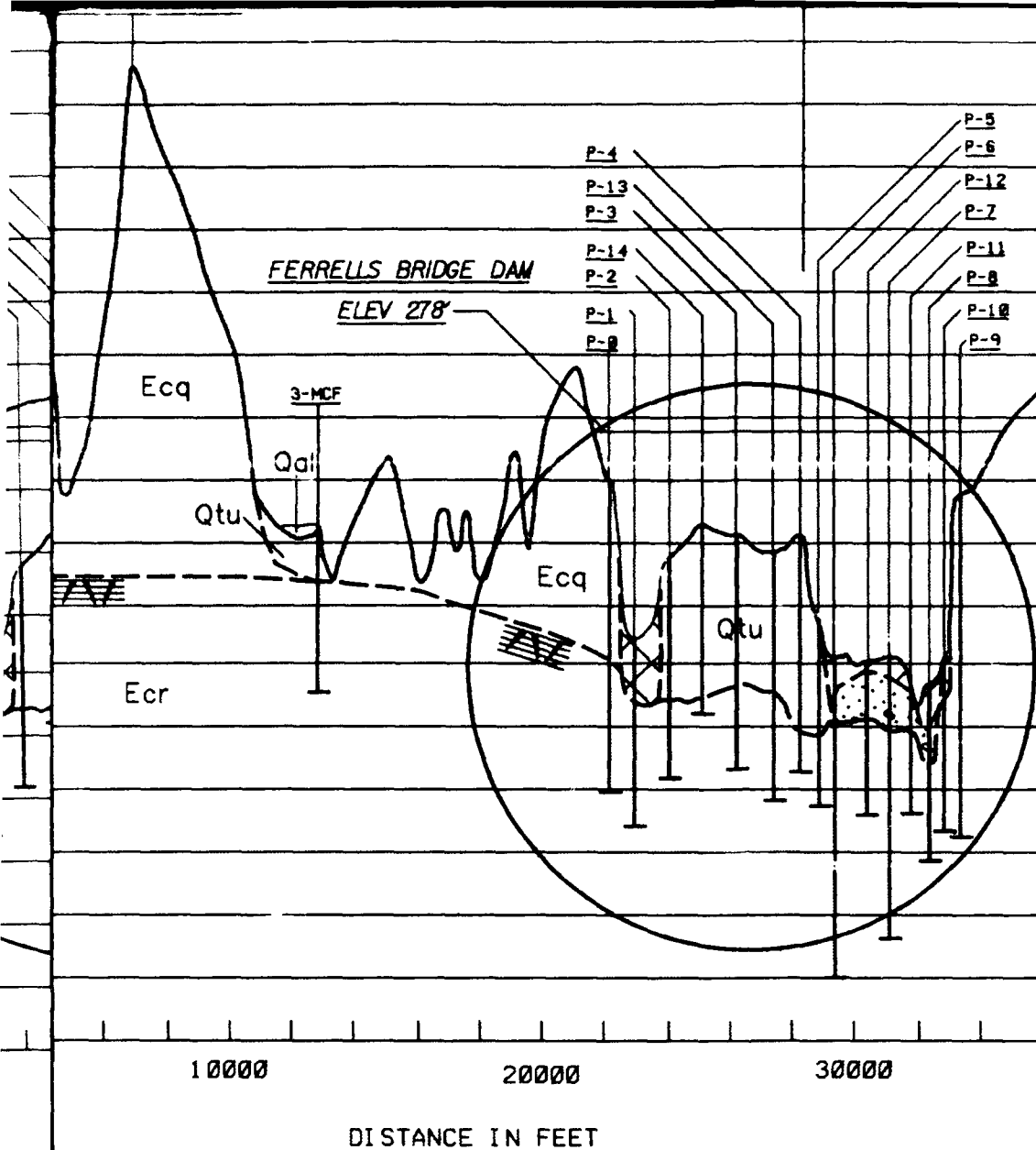
	NATURAL LEVEE
	POINT BAR
	BACKSWAMP
	ABANDONED CHANNEL
	ABANDONED COURSE

#### LITHOLOGY

	UNDIFFERENTIATED SAND AND GRAVEL
	SAND
	SILTY SAND
	SILT
	SANDY CLAY
	CLAY
	SHALE
	FILL

#### MAPPING SYMBOLS

	ALLUVIUM UNDIFF.
	TERRACE DEPOSITS UNDIFF.
	TERTIARY SURFACE
	SPARTA
	WECHES
	QUEEN CITY
	REKLAW
	WILCOX UNDIFF.



#### MAPPING SYMBOLS

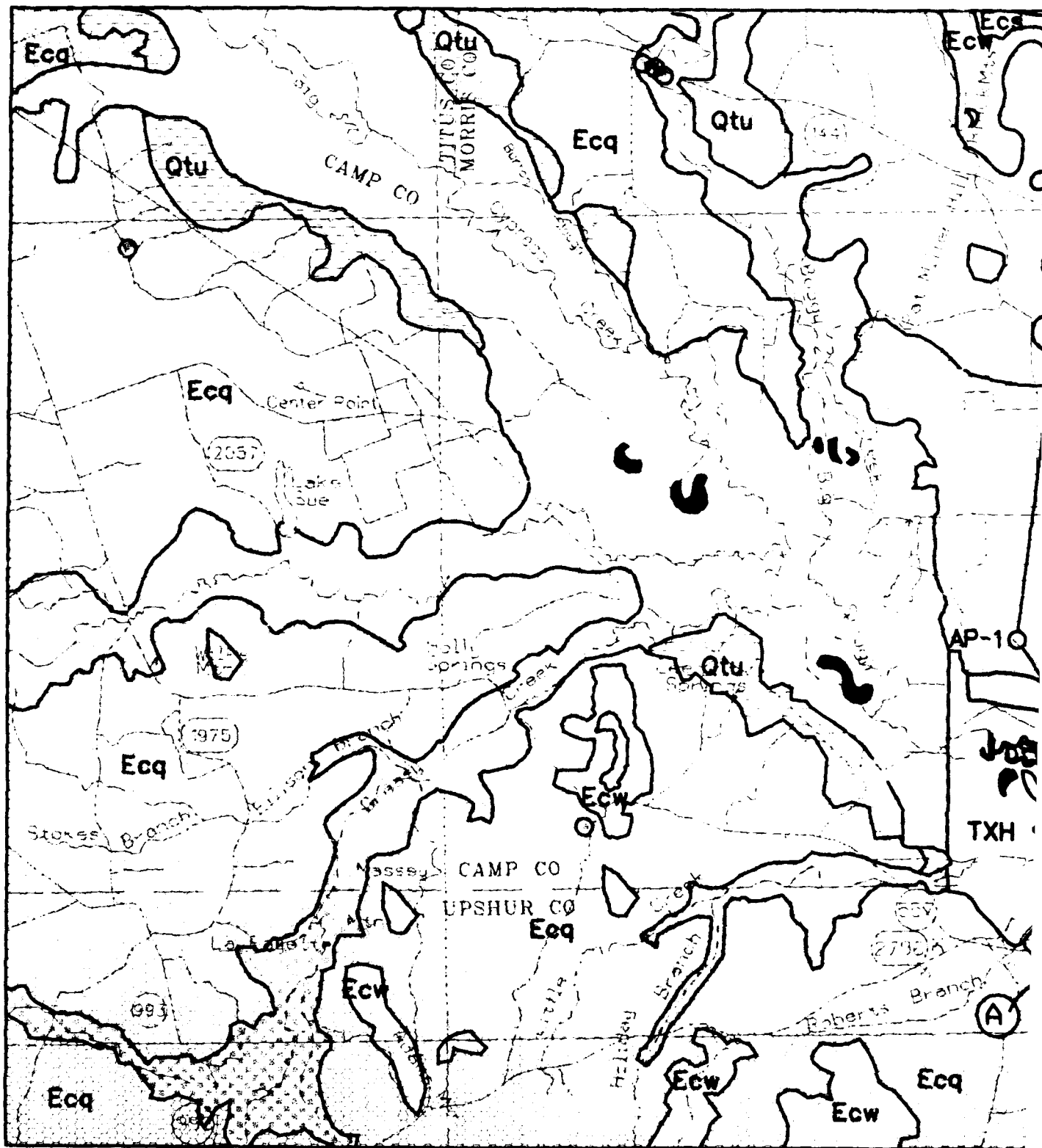
Qal	ALLUVIUM UNDIFF.
Qtu	TERRACE DEPOSITS UNDIFF.
	TERTIARY SURFACE
Ecs	SPARTA
Ecw	WECHES
Eoq	QUEEN CITY
Eor	REKLAW
Ewu	WILCOX UNDIFF.

GEOLOGICAL INVESTIGATION  
SHREVEPORT, LA - DAINGERFIELD, T)

SECTION B - B'  
LAKE O' THE PINES  
(FERRELLS BRIDGE DAM)

94° 52' 30"

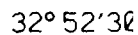
33° 00' 00"



32° 52' 30"

94° 52' 30"

33° 00' 00"



94° 37' 30"

# LEGEND

## QUARTEARNARY

### RECENT

-  NATURAL LEVEE
-  POINT BAR
-  BACKSWAMP
-  ABANDONED CHANNEL
-  ABANDONED COURSE
-  UNDIFFERENTIATED ALLUVIUM






### PLEISTOCENE





-  UNDIFFERENTIATED TERRACE DEPOSITS

## TERTIARY

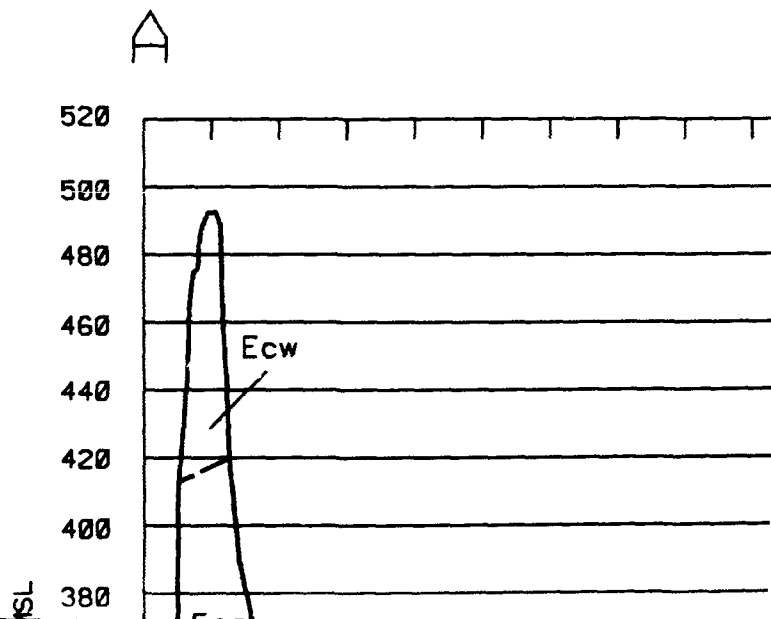
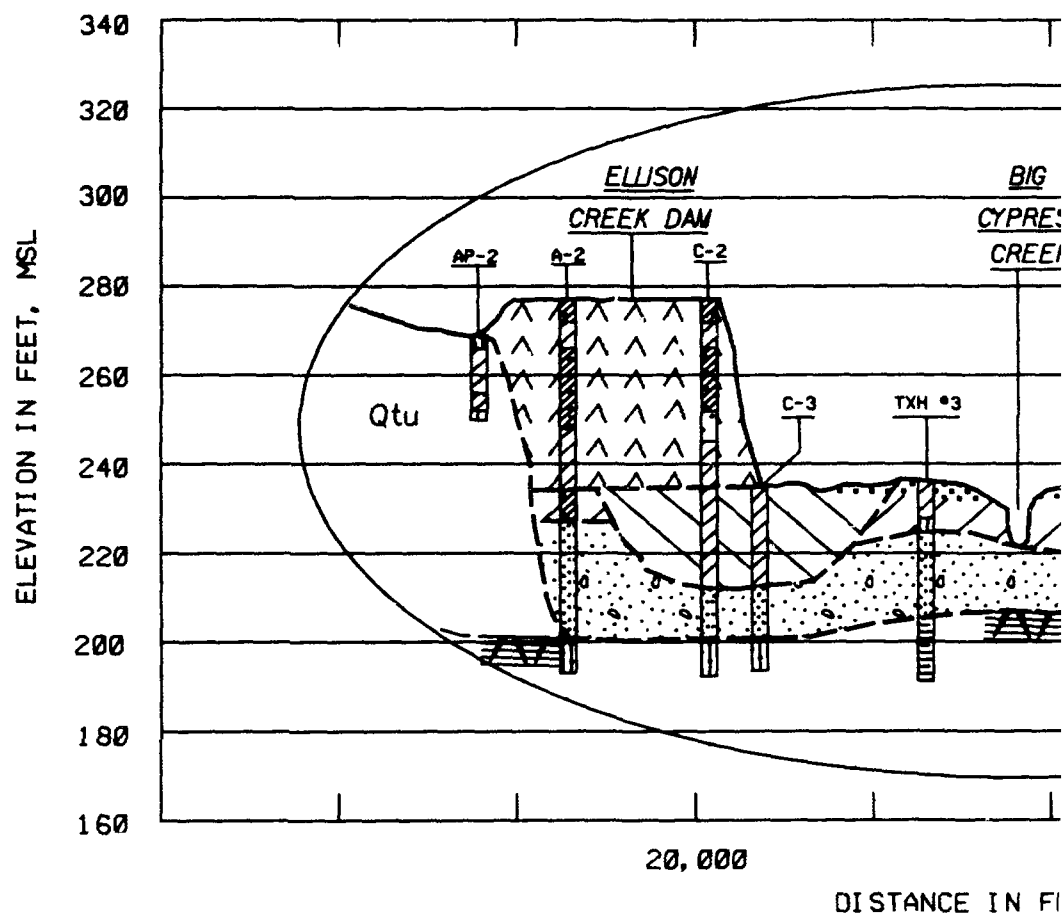
### EOCENE

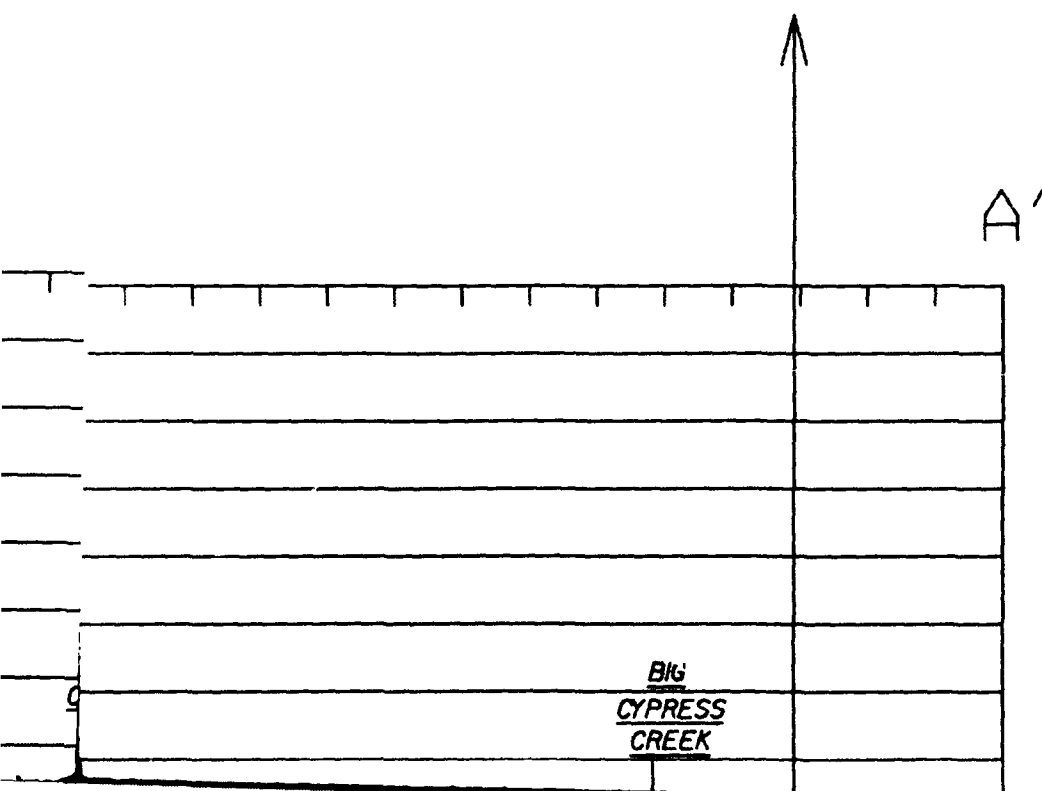
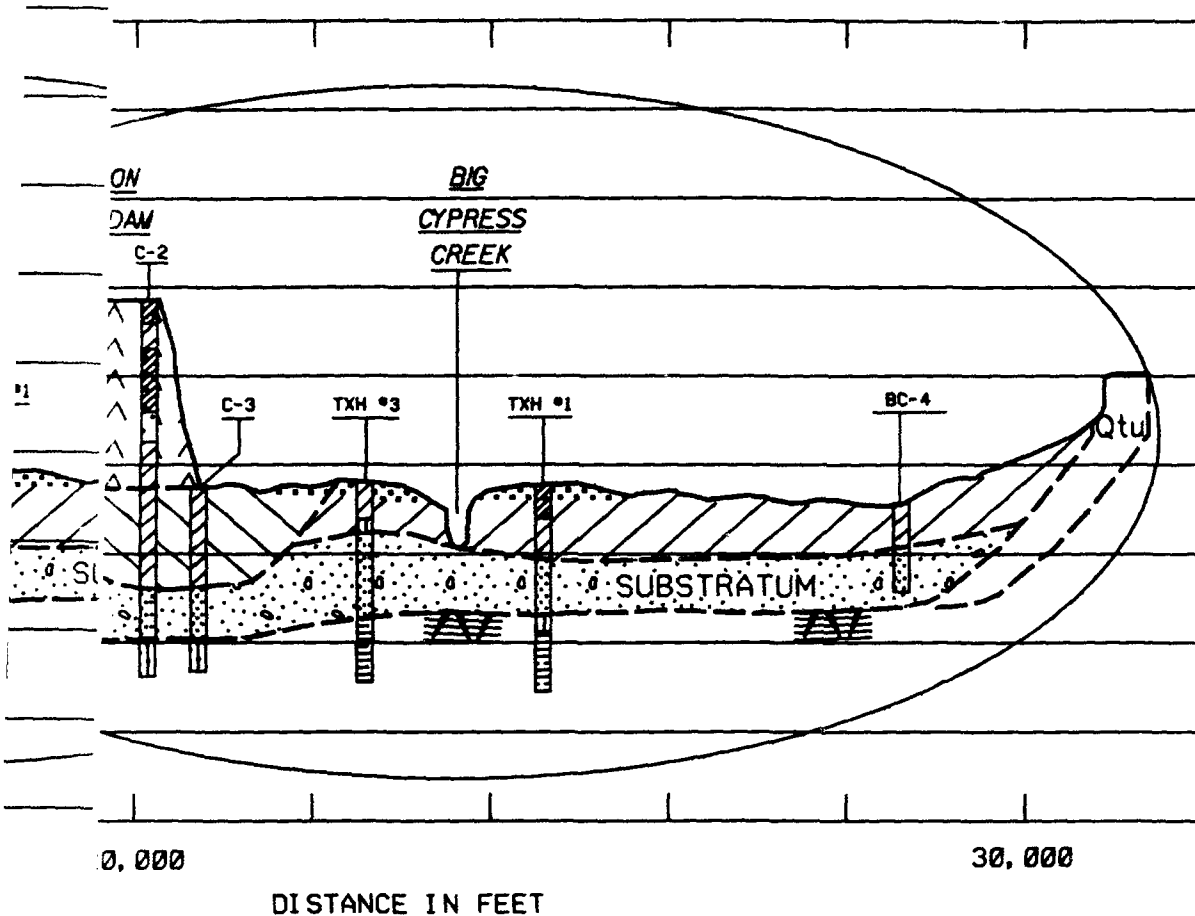
#### CLAIBORNE GROUP

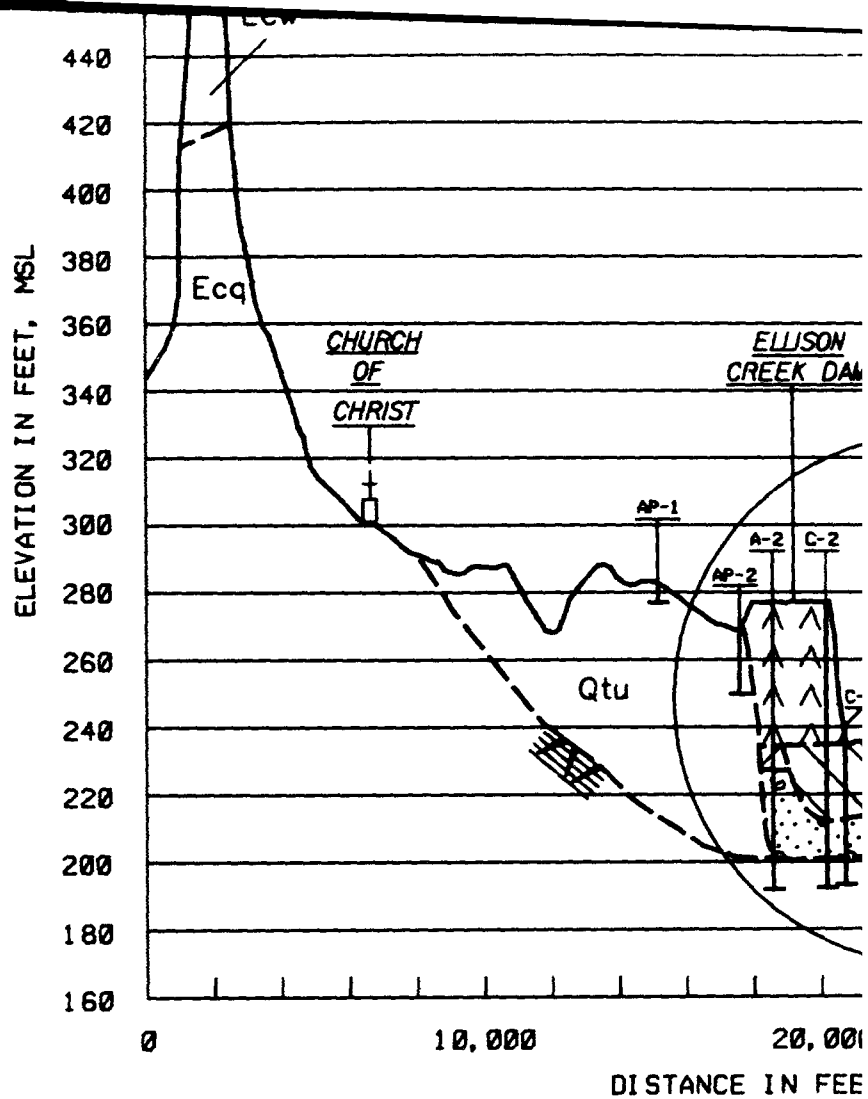
-  SPARTA FORMATION
-  WECHES FORMATION
-  QUEEN CITY FORMATION
-  REKLAW FORMATION
-  WILCOX GROUP UNDIFFERENTIATED

-  CONTACT
-  FAULT
-  BORING
-  PIEZOMETER

SHREVEPORT, LA - DANGERFIELD, TX  
SURFACE GEOLOGY  
LONESTAR, TX  
2/92







### LEGEND

#### ENVIRONMENTS OF DEPOSITION

	NATURAL LEVEE
	POINT BAR
	BACKSWAMP
	ABANDONED CHANNEL
	ABANDONED COURSE

#### LITHOLOGY

	UNDIFFERENTIATED SAND AND GRAVEL
	SAND
	SILTY SAND
	SILT
	SANDY CLAY
	CLAY
	SHALE
	FILL

#### MAPPING SYMBOLS

	ALLUVIUM UNDIFF.
	TERRACE DEPOSITS UNDIFF.
	TERTIARY SURFACE
	SPARTA
	WECHES
	QUEEN CITY
	REKLAW
	WILCOX UNDIFF.

BIG  
PRESS  
CREEK

BIG  
CYPRESS  
CREEK

CHURCH  
OF  
CHRIST

ELLISON  
CREEK DAM

TXH

IBSTR

AP-1

A-2

C-2

AP-2

TXH #3

TXH #1

BC-4

Ecq

Qtu

Qtu

SUBSTRATUM

10,000

20,000

30,000

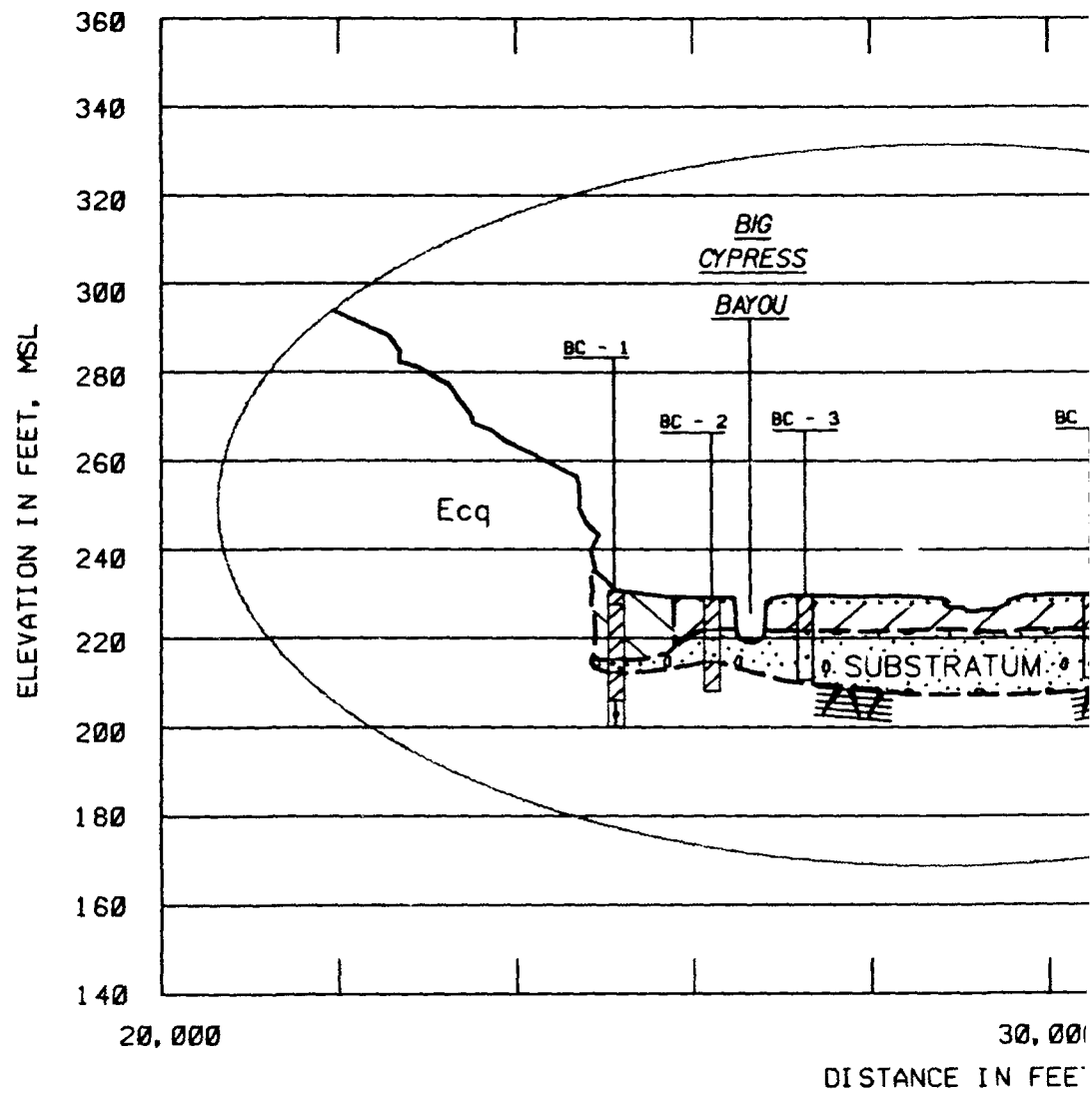
DISTANCE IN FEET

# MAPPING SYMBOLS

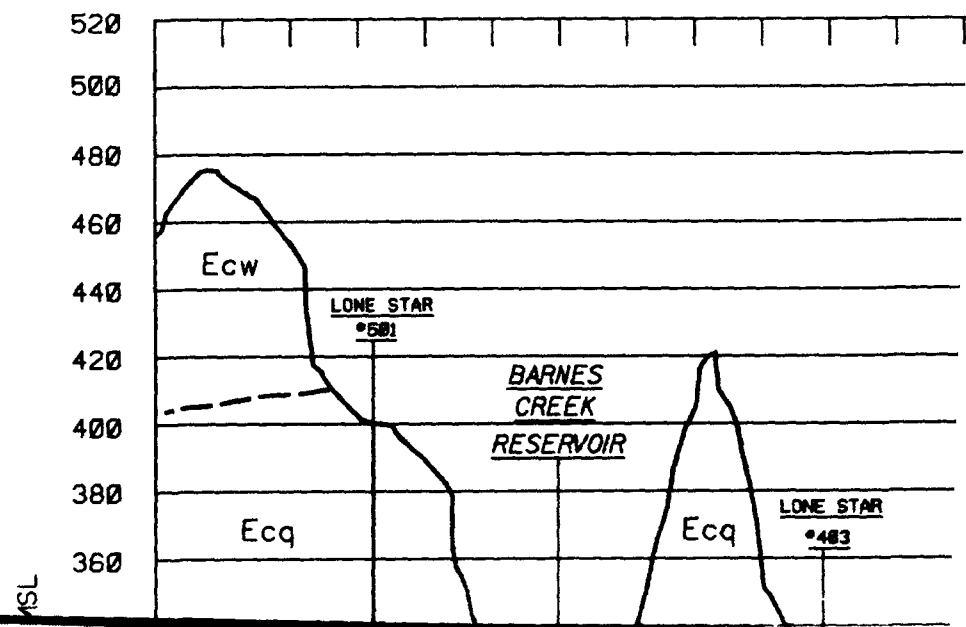
Qal	ALLUVIUM UNDIFF.
Qtu	TERRACE DEPOSITS UNDIFF.
	TERTIARY SURFACE
Eos	SPARTA
Eow	WECHES
Eqq	QUEEN CITY
Eor	REKLAW
Ewu	WILCOX UNDIFF.

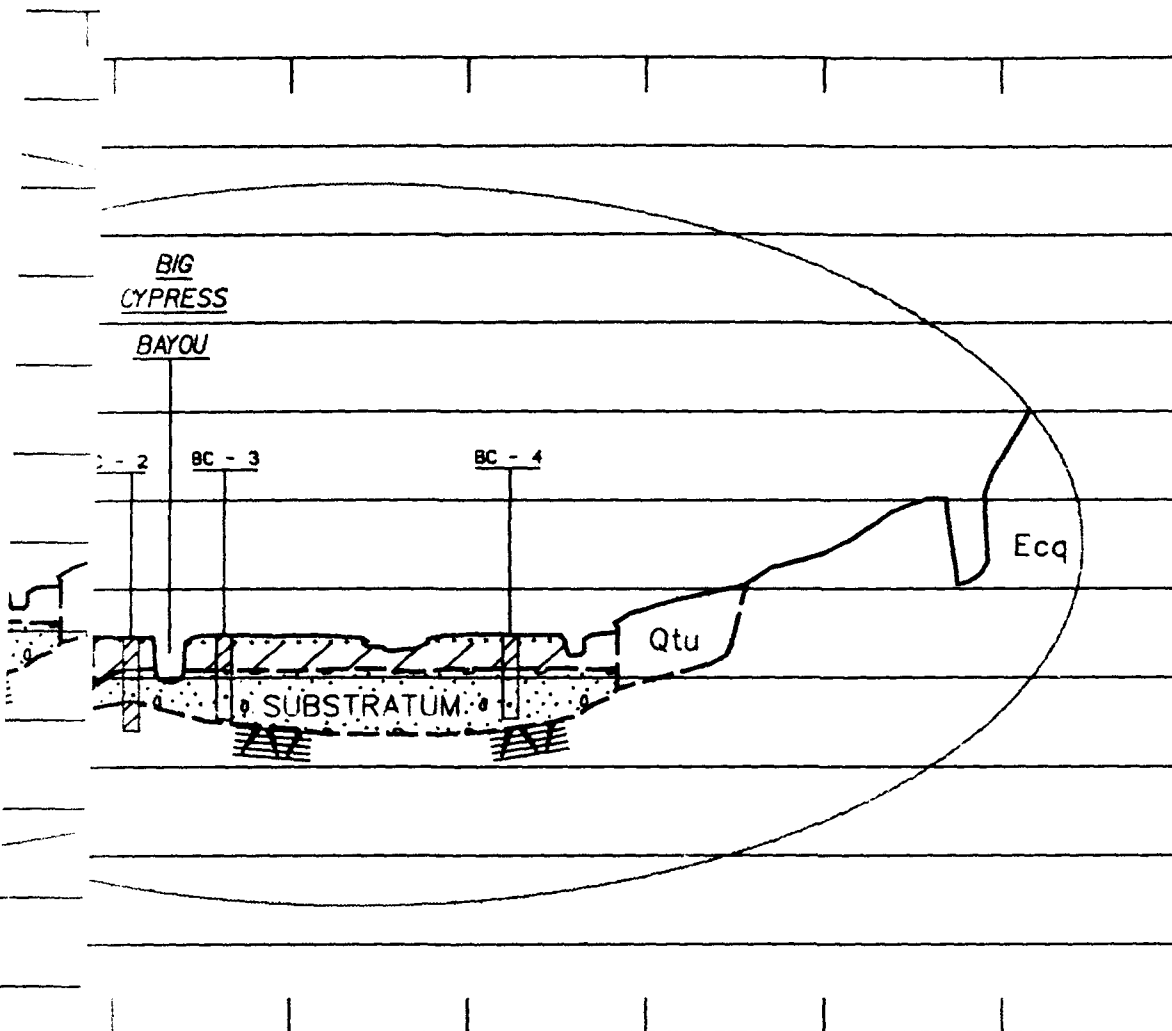
GEOLOGICAL INVESTIGATION  
SHREVEPORT , LA - DAINGERFIELD , T

SECTION A - A'  
LONESTAR  
(ELLISON)

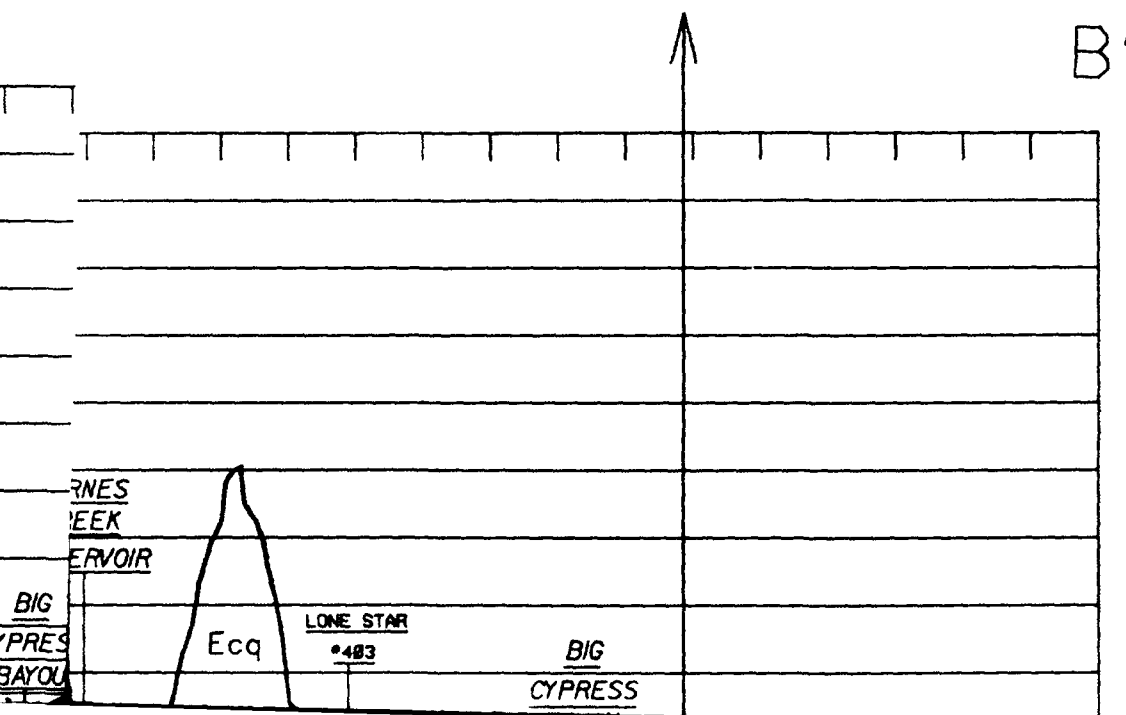


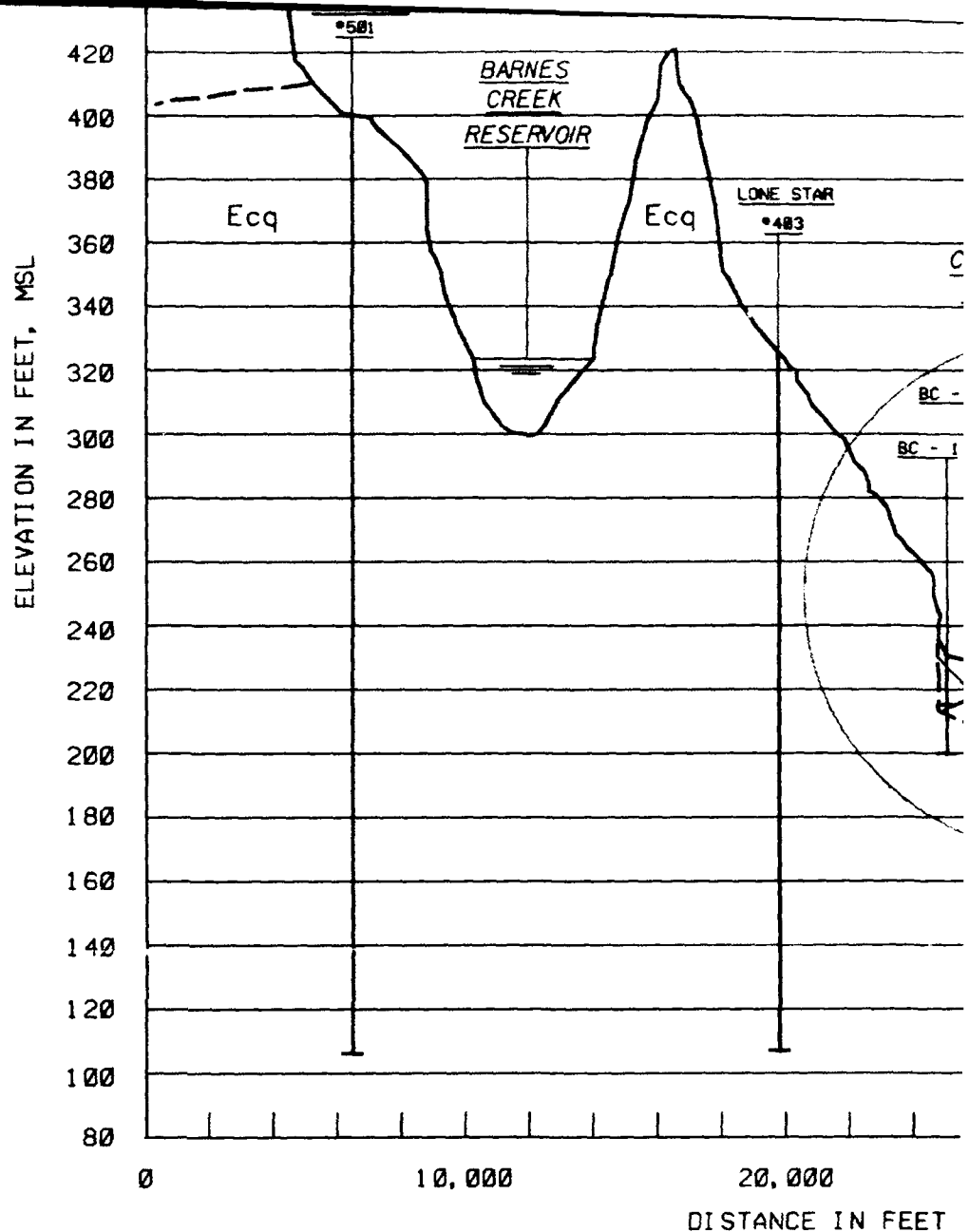
B





30,000  
DISTANCE IN FEET





### LEGEND

#### ENVIRONMENTS OF DEPOSITION

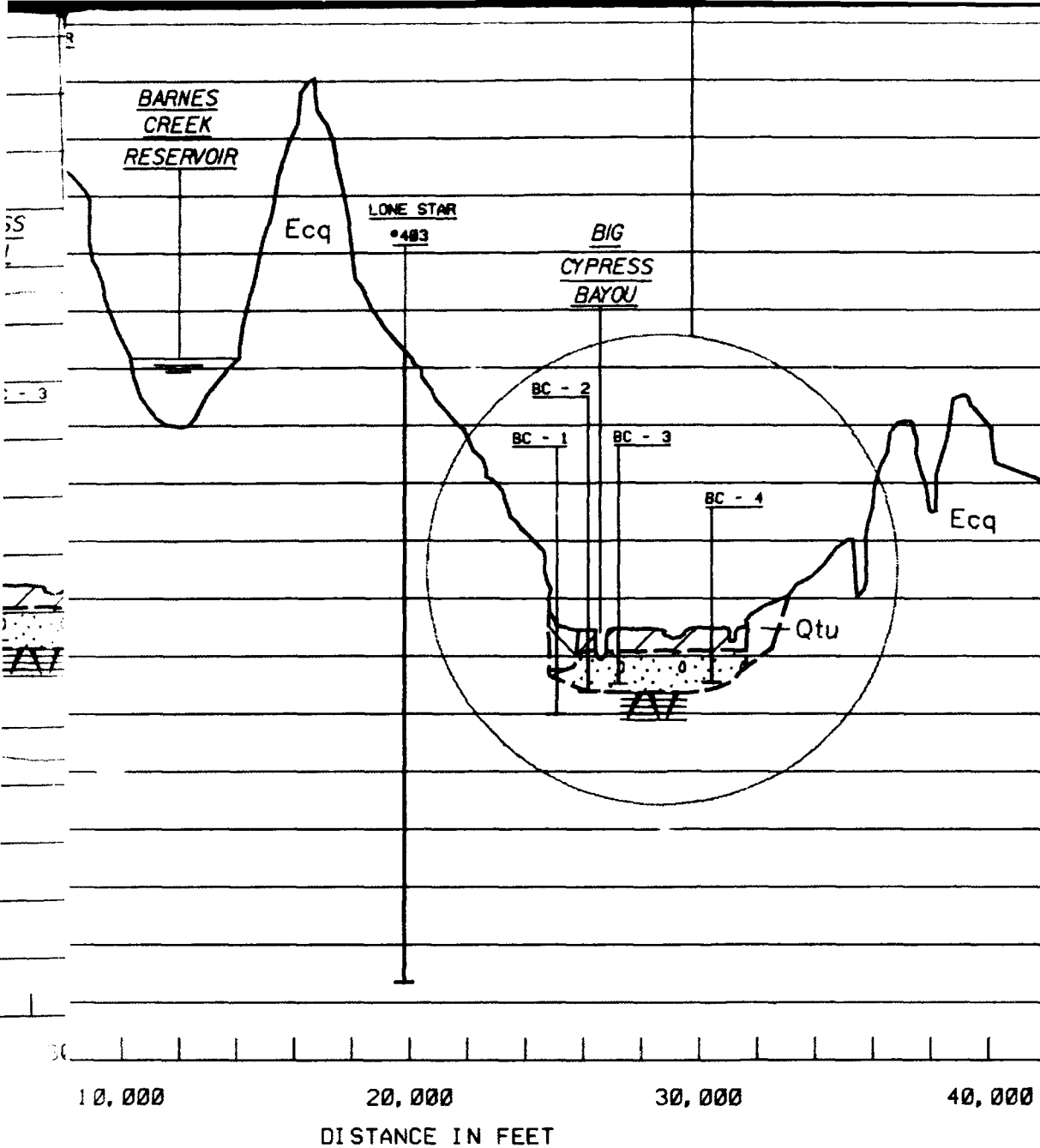
	NATURAL LEVEE
	POINT BAR
	BACKSWAMP
	ABANDONED CHANNEL
	ABANDONED COURSE

#### LITHOLOGY









	UNDIFFERENTIATED SAND AND GRAVEL
	SAND
	SILTY SAND
	SILT
	SANDY CLAY
	CLAY
	SHALE
	FILL

#### MAPPING SYMBOLS

	Qal ALLUVIUM UNDIFF.
	Qtu TERRACE DEPOSITS UNDIFF.
	TERTIARY SURFACE
	Eos SPARTA
	Eow WECHES
	Eqq QUEEN CITY
	Eor REKLAW
	EWU WILCOX UNDIFF.



#### MAPPING SYMBOLS

	ALLUVIUM UNDIFF.
	TERRACE DEPOSITS UNDIFF.
	TERTIARY SURFACE
	SPARTA
	WECHES
	QUEEN CITY
	REKLAW
	WILCOX UNDIFF.

GEOLOGICAL INVESTIGATION  
SHREVEPORT, LA - DAINGERFIELD, T

SECTION B - B'

LONESTAR  
(HIGHWAY 259)